The Pan-Pacific Entomologist

Vol. VII, No. 1 July, 1930

BEEBEA GUGLIELMI SCHAUS, A PYRALID MOTH BORER OF THE OPUNTIA CACTUS IN THE GALAPAGOS ISLANDS

BY FRANCIS X. WILLIAMS

Hawaiian Sugar Planters Association Experiment Station

BEEBEA GUGLIELMI Schaus

(Zoölogica; New York Zoölogical Society, V, 2, p. 46, Pl. II, Fig. 22, 1923, male, and notes by William Beebe l, c. v, 3, p. 54, 1924.)

This rather large, silky, grayish-brown moth that belongs to the subfamily Pyralinæ, was found by Dr. Schaus to represent a new genus and species and was described by him from a male specimen taken by William Beebe in April 1923, on Chatham Island, Galapagos, on the Williams Galapagos Expedition of the New York Zoölogical Society.

A small reared series (5 ♀ ♀ and 3 ♂ ♂) of this moth, together with its larva, pupa and empty cocoons,[1] were collected by the writer while he was field entomologist to the California Academy of Science's Expedition to the Galapagos Islands in 1905-1906. The few drawings and other data referring to this insect and which for the most part have lain fallow for over two decades, may be of some little interest in view of the importance of certain insects that live upon cacti of the genus Opuntia, and so they are herewith presented.

Beebea guglielmi is evidently widely distributed over the more arid lowlands of the Galapagos where its food plant, the Prickly-pear cactus, is abundant. Beebe's specimen was taken on Chatham Island; specimens were reared by me from material collected on Albemarle (Cowley Mountain), Bindloe and Abingdon islands, and I also collected, or observed, hatched cocoons of this moth on Daphne Islet and South Seymour Island, both near Indefatigable Island, and on James and Duncan islands. The adult moths issued during September and

1 All this material is in the collection of the California Academy of Sciences.

October, 1906, from infested cactus branches collected a short time previous. The female of *Beebea guglielmi,* which seems not to have been described, appears to average somewhat larger in size than the male and its antennæ, instead of being plumose as in that sex, are thread-like with two ranks of fine bristle-like hairs along their length. The largest female specimen has a wing expanse of 72 millimeters or nearly three inches. The type, a male, is in the collection of the United States National Museum and expands 58 millimeters. Unfortunately the large larva and pupa collected are not now available and so adequate descriptions of them cannot be made. The larva, when full fed, is of a dirty whitish color though pinkish above, and bears brownish plates. It is solitary in habit, at least when well grown, and its presence in the cactus is revealed by its droppings at, or below, the entrance to its boring which, often situated in the middle of a flat branch, is irregularly commodious. Such a gallery is weakly lined with fine silk and its opening to the exterior may be extended as a delicate silken tube. When ready to form a cocoon the larva leaves its tunnel and spins a rather tough cocoon some 33-35 millimeters long by about a third as thick, securing it along one side to the cactus plant and covering it to some extent with available material, such as cactus spines and lichens, so that the structure is not readily discernible. Soon it moults to change into a reddish-brown pupa that may be 26 millimeters long, as is the specimen figured.

The caterpillars of Beebea were not observed doing much damage to their food plant and without doubt natural enemies hold it somewhat in check.

Of the rather large number of insects that attack the prickly pear in the United States and American tropics and subtropics a considerable proportion are the caterpillars of moths belonging to the family Pyralidæ. Of these are several species of the genus Melitara (sens. lat.) represented by species the caterpillars of which are more or less solitary or that live in colonies, *i. e.,* gregariously within the plant.

Considerable work has been done on cactus insects; of the publications referring to this subject, "The Principal Cactus Insects of the United States," by Hunter, W. D., Pratt, F. C., and Mitchell, J. D., U. S. D. A., Bu. Ent. Bull. 113, 192, is

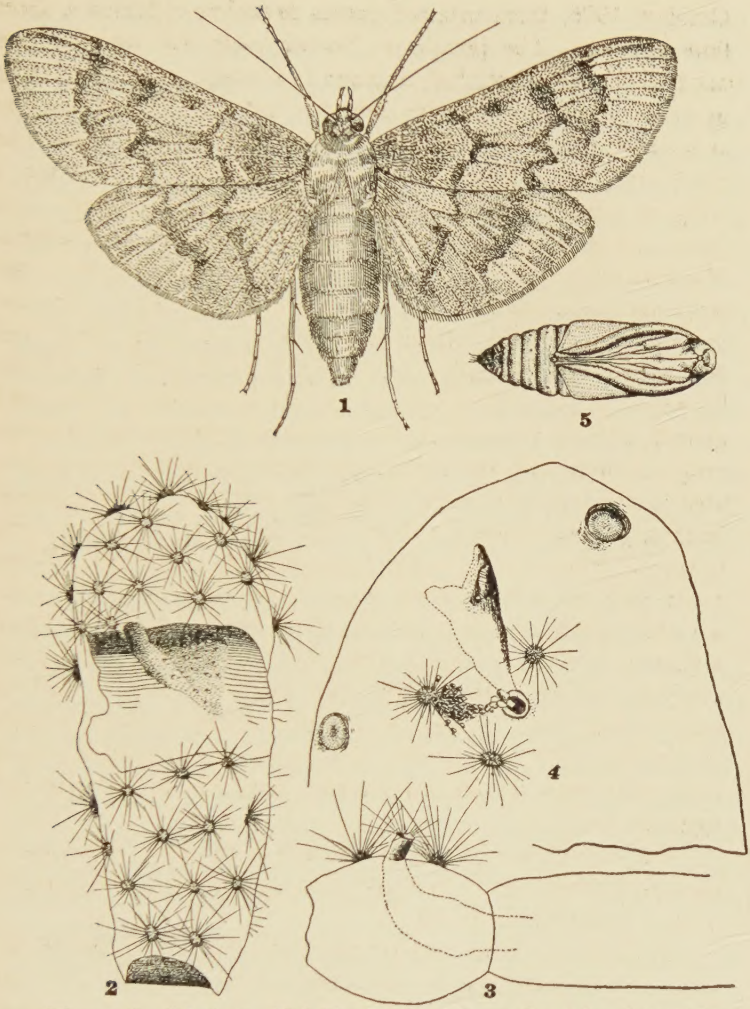


Figure 1. Moth ♀. X 1.35. Cowley Mountain, Albemarle Island.

Figure 2. Branch of Opuntia cactus with a portion scooped out to show excavation made by the caterpillar. Cowley Mountain, Albemarle Island.

Figure 3. Branch of Opuntia cactus showing profile view of the delicate silk-spun tube that extends from the entrance to the burrow of a large caterpillar. Cowley Mountain, Albemarle Island.

Figure 4. Broadside view of portion of Opuntia cactus branch to show excavation and the ejected frass of the caterpillar. Cowley Mountain, Albemarle Island.

Figure 5. Pupa. X 1.35. Galapagos.

important. Of more recent date is J. C. Hamlin's paper, "Important Opuntia Insects of the United States"; "Biological Notes on the Moth Borers (Pyralidæ)," PAN-PACIFIC ENTOMOLOGIST, II, pp. 1-11, 1925. Of still more recent date is a paper by A. C. Dodd ("The Biological Control of Prickly Pear in Australia," Bull. 34, pp. 1-44, 9 plates; Council for Scientific and Industrial Research, Commonwealth of Australia, Melbourne, 1927). To quote from Dodd's paper, p. 24: "The internal-feeding, boring, or tunneling caterpillars form one of the largest groups of cactus insects" . . . "Most of these caterpillars form a compact group of closely related genera, each genus containing several species. Those genera are Melitara, Cactoblastis, Yosemitia, Zophodia, and Ozamia, in North America, and Cactablastis and Tucumania in South America," and p. 31: "Without doubt, *Cactoblastis cactorum* is the most promising of the internal-feeding caterpillars." This species, which lives in large colonies, is closely related to Melitara.

A NEW EDITION OF COMSTOCK'S MANUAL[1]

All students of insects, especially beginners and those engaged in teaching entomology, will welcome a new edition of Dr. Comstock's Manual. Professor Herrick has undertaken the task of cutting down and bringing up to date the old Comstock Manual on the plan laid out by Dr. Comstock and has done this well. So we now have available a text book for students and amateurs that leaves little to be desired. It is concise and accurate and covers the subjects for which the work was designed. For more detailed studies one should consult Comstock's Introduction to Entomology or some similar work. The illustrations and typography are excellent and the book is not overly large or unwieldy.

Personally, and as a student of the Hemiptera, the present writer does not approve of separating the Homoptera as an order distinct from the Heteroptera, as the only character available, the position of the rostrum, is not a difference in structure, but of position, and there is no clear line of demarkation between these and the Heteroptera. If used as separate orders the first should have been designated as Heteroptera, as the name Hemiptera applies to both groups and is not available for either separately.—E. P. Van Duzee.

1 A Manual for the Study of Insects, Revised Edition. By John Henry Comstock, Anna Botsford Comstock and Glenn W. Herrick, Nineteenth Edition. Comstock Publishing Company, Ithaca, New York, 1930, $4.00.

A NEW SUBGENUS OF ANDRENINE BEES

BY T. D. A. COCKERELL

I am greatly indebted to Mr. P. H. Timberlake for permission to study and describe another of his remarkable discoveries. It is an Andrenine bee, which is so peculiar that when a specimen was submitted to a well-known authority some years ago, it was declared to be apparently a new genus of Panurgidæ.

Ancylandrena Cockerell, new subgenus of Andrena

Medium-sized bees, with the general characters of Andrena; the male with abundant long erect hair on head, thorax and abdomen; face with a pale band along each inner orbit; ocelli in a slight curve; cheeks rounded, not toothed; antennæ ordinary, third joint (which has short brownish hair on upper side) much longer than fourth, but not so long as fourth and fifth; the second and third joints are dull and rugosopunctate, contrasting with the very minutely sculptured, somewhat shining joints beyond; last joint obliquely truncate at apex; malar space practically obsolete; mandibles ordinary; briefly bidentate; labrum transverse, with a crescentic sulcus, its lower margin with long straight orange hairs; maxillary palpi long, six-jointed, the joints more or less equal, but the fifth much shorter than fourth or sixth, and the second distinctly shorter than first; labial palpi ordinary; tongue very short, pointed; anterior wings with small lanceolate stigma; marginal cell ending obtusely just below costa; basal nervure almost meeting intercubitus, but a very little distad of it, three cubital cells, the second large and subquadrate, receiving the first recurrent nervure near its apex; legs ordinary; pygidial plate large and pointed; genitalia peculiar, the claspers with a large tubercle below, the saggittæ represented by a long curved swordlike structure (whence the subgeneric name), extending forward;[1] the seventh ventral plate terminates in a crescentic structure, beset with long hairs; the eighth plate is not notched.

Female with the shining clypeus flattened on disc; malar space very short but evident; labrum obtusely binodose; antennæ with third joint very long, longer than next two together; facial foveæ very short, not extending down to level of antennæ, overlapped by long hairs; lower part of eyes with scattered hairs; area of metathorax smooth and shining; abdomen with well-defined hair bands; scopa of hind legs dense and compact, the hairs nearly all simple.

I do not find any hair on the eyes of the male. There has been some question about the association of the sexes, but apparently they belong together, as they are sufficiently alike,

[1] Mr. E. Nelson points out to me that the otherwise very different Andrena cratægi Rob. has a similar downwardly directed structure.

fly at the same time, and there is nothing else known in the fauna to associate with either.

In Robertson's system this falls nearest to Opandrena, to which it seems really to be related. It is an isolated type, and until or unless more species are found it will be difficult to say how many of the above characters should be included in the diagnosis of the subgenus. The relationship seems to be North American entirely. I find nothing similar in the Asiatic fauna.[2]

Andrena (Ancylandrena) heterodoxa Cockerell
new species

Male (type). Length about 8.5 to 10 mm.; black, with a creamy-white band along each anterior orbit, rather broad just above mandibles, gradually narrowing, and coming to a point just below level of antennæ; head broad, facial quadrangle about square; clypeus and sides of vertex shining; face, front and cheeks covered with very long white hair; vertex with long black hairs, but also some pale; disc of mesothorax brilliantly polished, the punctures scattered and feeble, but the marginal areas are dullish; scutellum moderately shining; area of metathorax triangular, shining, with a transverse ridge; thorax with abundant long white hair, mixed with black dorsally, giving a gray effect; tegulæ shining black; wings hyaline, with very dark nervures and stigma; legs with white hair, creamy white on inner side of hind basitarsi; abdomen dullish; closely and rather coarsely punctured, the edges above the apical depressions rather swollen; second tergite in middle depressed about a third; depressed portions punctured, their hind margins with extremely narrow pallid bands; tergites with long erect white hair, faintly stained with brownish; white marginal hair bands fairly distinct on third and fourth, and well developed on fifth; apex with white hair; venter shining.

Female. Length about 11 mm.; facial foveæ pale reddish; vertex and disc of thorax (invading middle of scutellum) with much black hair; legs with mainly white hair, the scopa of hind legs shining; anterior tarsi with hair soft gray or dilute black on outer side, pale orange on inner; middle and hind tarsi with white hair, fulvous at apex of basitarsi within; spurs light ferruginous; abdomen shining, first tergite with long white hair, second to fourth with thin short black hair; but tergites 1 to 6 with broad pure white hair bands, more or less interrupted on first; caudal fimbria pale gray; second

2 The old World Ancyla has marginal cell ending far from costa; hind legs of male peculiar.

tergite in middle depressed considerably more than half, the margin of the depression strongly arcuate, so that it is narrow at the sides; venter with white hair bands. The third and fourth tergites have a band of pale hair at the base. The flagellum is distinctly rufescent beneath.

Type (male) at flowers of *Cryptanthe intermedia,* Riverside, California, April 25, 1930 (Timberlake). Another male at *Eriogonum fasciculatum,* May 20, 1926. Females at *Lupinus paynei,* May 11, 1929; also at *Lotus scoparius* and *Hugelia virgata.**

The male will be easily recognized by the peculiar face markings. The following table separates the female from others more or less similar in appearance, being of medium size, and with conspicuous hair bands.

Caudal fimbria dusky chocolate color or gray..... 1
Caudal fimbria pale..... 4

1. Wings very dark; abdominal bands fulvous-tinted; basal nervures going basad of nervules.....*fulvipennis* Smith
   Wings not dark; basal nervures meeting or (some *sapellonis*) falling short of nervules..... 2
2. Disc of mesothorax with black hair.....*heterodoxa* n. sp.
   (Compare also *peckhami* Cockerell.)
   Disc of mesothorax without black hair..... 3
3. Clypeus dullish, with a median ridge.....*sapellonis* Ckll.
   Clypeus polished without median ridge....*electrica* Casad and Ckll.
4. Flagellum, except basally, bright ferruginous beneath..... 5
   Flagellum dark..... 6
5. Larger; abdomen highly polished.....*gardinari* Ckll.
   (Equally large; flagellum obscure red beneath, abdomen finely punctured.....*ellisiæ* Ckll.)
   (Stigma small; flagellum obscurely reddish beneath..... *relatia* Vier.)
   Smaller; abdomen less polished, but mesothorax posteriorly and scutellum brilliantly polished and impunctate..... *persimilis* Graenischer
   (Also smallish, flagellum very obscurely reddened, but mesothorax posteriorly and scutellum polished in same fashion; clypeus with a median ridge, not present in *persimilis.* Two cubital cells.....*gibberis* Vier.)

* Since submitting the above material to Dr. Cockerell, another male was taken May 5 on Cryptanthe, at Riverside, California, and on May 15 Mr. C. M. Dammers and the writer collected seven males at flowers of Calochortus splendens on the Gavilan Mesa about fifteen miles south of Riverside.—P. H. Timberlake.

6. Mesothorax with short velvety tomentum.....*coachipostica* Vier.
(See also *plana* Vier., with chocolate fimbria.)
Mesothorax without such tomentum..... 7
7. Mesothorax entirely dull..... 8
(Dull in front; clypeus with a ridge.....*ellisiæ* Ckll.)
Mesothorax more or less shining..... 9
8. Clypeus dull (Los Angeles, California; Coquillett).....
..... *mustelicolor huardi* Vier.
Clypeus highly polished in middle (Texas, Bellfrage).....
..... *relativa* Vier.
9. Clypeus dull; wings fuliginous.....10
(Wings with dusky cloud at apex.....*fracta* Casad and Ckll.)
Clypeus shining 11
10. Tegulæ reddish black (Stanford University, California, March, on mustard) .....*scurra* Vier.
Tegulæ testaceous (Southern California).....
.....*davidsoni* Vier. and Ckll.
11. Upper part of clypeus flattened, no median ridge; basal nervure meeting nervulus .....*sieverti* Ckll.
Clypeus with a median ridge.....12
12. Larger; three cubital cells.....*ellisiæ* Ckll.
Smaller; two cubital cells.....*gibberis* Vier.

Lepidomys irrenosa Guenée (Lepidoptera)

In arranging the Noctuidæ in the collection of the California Academy of Sciences I found in the Koebele collection a little moth bearing the above name. It agrees in every respect with Guenée's description, except that it is more ochraceous than one would expect from that description, but it is strongly tinted with wine color, especially toward the apex of the wings. This specimen was taken by Mr. Koebele in Florida. Guenée says his type, a unique, was from New York and was taken by Doubleday. Dr. J. B. Smith (1893) says this type bears but one label, "Doubleday," with no mention of locality, and strongly suspects the insect to be tropical. Perhaps on the strength of this it was omitted from the Dyar and the Barnes and Mcdonnough lists. So far as I can learn there has been no recorded capture of a second specimen. It must now be re-established in our North American lists.—E. P. Van Duzee.

A NEW SPECIES AND VARIETY OF SCOLOPS WITH NOTES ON OTHERS (RHYNCHOTA FULGORIDÆ)

BY E. D. BALL

University of Arizona, Tucson

While working up recently collected material in the genus *Scolops*, the writer was impressed with the fact that most species had definite food plants to which they were apparently confined, and that in no case was the food plant a grass as Dozier and others have suggested. The fact that *osborni* Ball feeds exclusively on the compass plant of the lower plains region (*Silphium laciniatum* L.) has already been recorded. The writer on checking over his notes found that at least four other species, one of them being new, were apparently confined to different members of the Compositæ, two to different members of the Chenopodiaceæ and one to an Euphorbiaceæ. The two most widely distributed species of the genus, *sulcipes* Say and *pungens* Germ., are found abundantly in weedy and waste places and are likely to be found to be Compositæ feeders also. Breakey states that the typical habitat of the group is in moist places near the edge of woodlands and in low spots in the prairies. This, however, conveys a decidedly erroneous impression of their habits as observed by the writer. They are lovers of hot, dry and open situations, and are rarely found in damp or shaded locations.

S. robustus Ball has been found by the writer feeding exclusively on the perennial ragweed (*Ambrosia psilostachya* D. C.) in Colorado, Utah, and Arizona. *S. viridis* Ball, a pale green species, is exactly the color of the foliage of the saltbush (*Atriplex canescens* James), on which the writer has always found both nymphs and adults feeding.

Scolops graphicus Ball, new species

Intermediate in size, form, and color markings between *maculosus* Ball and *uhleri* Ball, and resembling *stonei* Break. in color and pattern, but much smaller. Dark gray with irregular white streaks and flecks, strikingly resembling the dorsal pattern of an eastern quail or meadow lark. Length, 6-7 mm.

Cephalic process slightly longer than in *maculosus*, much narrower and straighter, not as long as in *uhleri*, but even more slender. Elytra very broad and short giving a peculiar and characteristic truncate appearance. Cubitus forking just back of the junction of the claval veins, and medius forking distinctly beyond the cubitus.

Color dark, smoky, with broad white costal margins, a pair of narrow wavy stripes along the inner-claval veins, a secondary stripe arising on cubitus before the fork and fusing posteriorly with the inner stripe. These two stripes set off a definite dark brown or black stripe centering on medius with four or five white dots along the vein and a row of black spots around the apex. Vertex greenish with a pair of obscure spots; disk of pronotum white with a pair of dark spots. Scutellum with a broader median wavy stripe and a pair of widely separated dots. Heavily marked examples lose the inner pair of ivory stripes.

Holotype, female, allotype, male (in E. D. Ball collection) and four paratypes taken by the writer on the "match brush" or rayless goldenrod (*Gutierrezia californica*) at Yarnell Heights, Arizona, October 8, 1929, and six paratypes taken at Cline, Arizona, August 2, 1929, on the same plant. Only nymphs were taken July 14, adults and nymphs later in July and August, and only adults in October. This is the smallest species yet described and it appears to be strictly confined to this very fine-stemmed plant.

Scolops uhleri Ball has been taken by the writer many times on the annual *Dondia depressa* Wat. growing in alkali areas in western Colorado and southern Utah.

Scolops uhleri marginatus Ball n. subsp.

Resembling *uhleri* in general size and form, but usually larger and lighter colored with a pair of broad smoky or black stripes just inside the costal ivory stripes. The dark stripes with only two or three light spots on the veins. About four black spots at the apex. Cephalic process slightly shorter and much darker than in typical *uhleri*. Length, 7-8 mm.

Holotype, female, and allotype, male (in E. D. Ball collection), taken by the writer near Sacaton (labeled Tucson), Arizona, June 19, 1929, and six paratypes taken at St. George, Utah, July 24, 1908 (Ball), and Glendale, Nevada, June 9,

1928 (E. W. Davis). This may prove to be a distinct species when more material is available for study. At least it is a distinct subspecies apparently confined to the subtropical Southwest. All specimens taken have been from the perennial shrub (*Dondia torreyana* Wat.). Large nymphs and just emerging adults were taken June 8 by the writer and only a few adults were found June 23.

S. perdix Uhl. was taken by Mr. Stone and the writer in abundance June 22, 1927, at Sanford, Florida, on a ridge in a flat woods area where the narrow-leaved sunflower (*Helianthus angustifolius* L.) appeared to be the only possible food plant. The known distribution and abundance of this species coincides very well with the distribution of this plant.

S. stonei Break. This very distinct species was found by Mr. William E. Stone (for whom it was named), Mr. J. A. Reeves, and the writer, to be confined entirely to the milky-juiced "queen's delight" (*Stillingia angustifolia* Torr.). Small nymphs were found at Sanford, Florida, in June, large nymphs and adults in July, and adults only in August and early September.

Both nymphs and adults of *S. snowi* Break. were taken by the writer on goldenrod (*Solidago trinervata*) at Long Valley, Flagstaff, and Williams, Arizona, in August 1929.

Breakey gives California and Idaho under the distribution of *S. hesperius*. The writer, who has made long series of collections in both areas, is inclined to believe that those were erroneous determinations and that *hesperius* is a plains' species extending from Dakota and Montana south to Texas. His statement that Ball records *osborni* from Ohio is in error. *S. osborni* Ball was described from Iowa and Kansas. The writer agrees with him in doubting the distribution records of *S. grossus* from California and New Jersey and would add Idaho. *S. grossus* is, like *hesperius*, only known from the plains region. Breakey describes *S. viridis* Ball as "cephalic process long and slender," but places it in his key under "cephalic process short."

THREE NEW SPECIES OF AMERICAN CIXIIDÆ (FULGOROIDEA, HOMOPTERA)

BY F. MUIR

Bennarella Muir, g. n.

Body compressed laterally; tegmen when at rest steeply tectiform, apical margins closely pressed together. Sc + R forking about one-third from base, level with Cu fork, the fork slightly more apical, M rising from basal cell; three apical Rs, five apical Ms, 1, 1a, 2, 3, 4; Cu touching M3 + 4 for a short distance; claval fork about one-third from base of clavus. The costal margin near base is turned upward where the fourth and fifth abdominal segments are produced. Vertex very short, width five or more times the length in middle; in dorsal view a large part of the base of frons visible, base of vertex sinuate, slightly emarginate, apex truncate. Length of frons nearly twice the width, sides slightly arcuate; disk slightly excavate on basal half where the lateral carinæ are longer; median carina obsolete, only distinct for a short distance in middle. Clypeus plainly tricarinate. Labium long, reaching beyond hind coxæ. Second joint of antennæ much longer than wide, reaching base of clypeus. Pronotum short, hind margin roundly excavate. Mesonotum slightly wider than long, bicarinate, the median carina only faintly represented on anterior portion. The third, fourth and fifth abdominal pleura produced, flattened and curved dorsad, the fourth bears three and the fifth two sense pits, each bearing a bifurcate hair. Hind tibiæ without spines; the second hind tarsus with a row of spines at apex.

This genus comes next to Bennaria, but the size and nature of the development of the abdominal pleura are very distinct. Superficially it looks like one of the Achilixiidæ, but an examination of the male genitalia shows that it is a Cixiidæ; also the claval vein enters the commissure distinctly before the apex.

Type *B. bicoloripennis.*

Bennarella bicoloripennis Muir, sp. n.

Male. Length, 2.4 mm.; tegmen, 4.4 mm.

Head and pronotum stramineous, light brown over most of frons and base of clypeus and pronotum behind eyes; mesonotum brown, carinæ lighter; labium fuscous; legs stramineous, the femora and tibiæ slightly fuscous; abdomen light brown, the produced fourth and fifth pleura and the genitalia lighter. Basal portion of tegmen to M fork dark brown, the claval margin and suture yellowish, apical portion of tegmen yellowish, slightly fuscous in costa and in Sc and R apical cells; veins mostly the color of the cells, without granules on macrotrichia. Wings fuscous at base, opaquely white with waxy

secretion over rest, veins fuscous at base and yellowish over apical portion.

Pygofer comparatively short, opening longer than wide, sides curved, medio-ventral process angular, small. Anal segment produced into a point at apex; the styles and ædeagus best understood from the figure.

Female similar to male in size and color. The ovipositor complete, pygofer longer than broad, a longitudinal depression in which the ovipositor lies when at rest; the ventral surface of anal segment concave and fits over the apex of ovipositor when at rest.

Described from four males and five females from Tumatumari, British Guiana (July 19, 1923). Type in H. S. P. A. Experiment Station collection, Honolulu, No. 1216.

Bennarella fusca Muir, sp. n.

Male: length, 2.4 mm.; tegmen, 4 mm.

In general structure similar to *bicoloripennis,* but the lateral carinæ of the frons larger and the antennæ slightly shorter.

Head and thorax fuscous brown, the carinæ lighter, the lateral portion of the mesonotum darker than the middle; coxæ and femora fuscous; tibiæ lighter. Tegmina fuscous, basally lighter, nodal line lighter. Wings dark fuscous, veins dark.

Pygofer laterally compressed, sides arcuate, medio-ventral process subconical in outline. Anal segment large, apex produced beyond anus, curved ventrad and under, asymmetrical, the right side emarginate. Genital styles small, in lateral view bent at an angle in middle, apex slightly expanded and rounded. Aedeagus not dissected out.

Described from one male from Belem, Brazil (May 1924). Type in H. S. P. A. Experiment Station collection, Honolulu, No. 1217.

The above two species were taken by Dr. F. X. Williams.

Nymphocixia vanduzeei Muir, sp. n.

Male: length, 5.6 mm.; tegmen, 5.7 mm.

This species agrees with the generic description and is closely related to *N. unipunctata* V. D. The base of vertex is truncate and overlaps the middle of pronotum and the middle of the anterior portion of mesonotum. The hind margin of the eye is nearly truncate and there is only a shallow antennal emargination on the ventral margin.

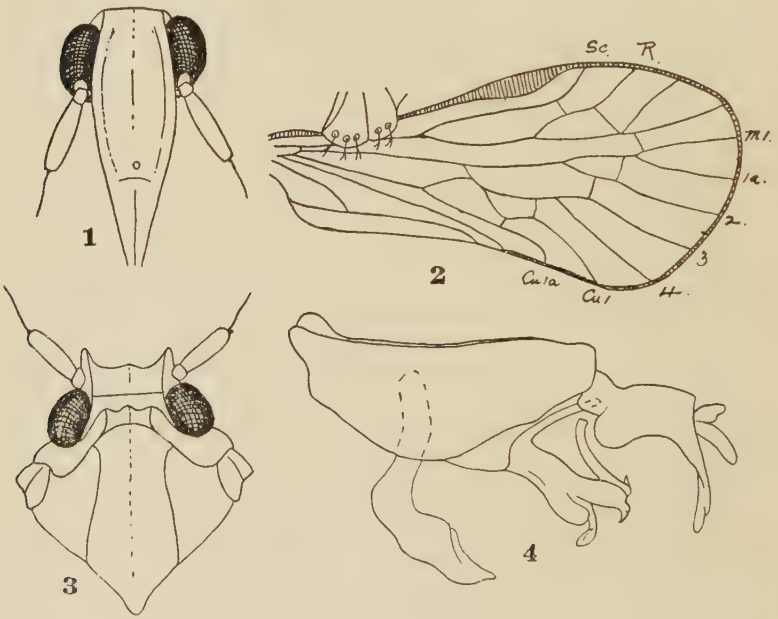
Pygofer compressed laterally, sides arcuate, medio-ventral process fairly large, subangular; anal segment median size, apex pointed; genital styles small, thin, apical third bent at a right-angle dorsad.

Stramineous or light brown, the carinæ of head and the genæ lighter. Tegmina stramineous or very light brown, clearer over membrane and costal cell, veins light; a small dark spot near apex between M 2 and 3. Wings hyaline with brown veins.

One male from Columbia, Cartagena (C. Gogzo, VIII, 1905).

Type in the Zoölogical Museum, Hamburg.

This is the second species of this interesting genus; the genotype taken on Espiritu Santo Island, Gulf of California.



1. Bennarella, frons.
2. Bennarella, tegmen.
3. Bennarella, dorsal view of head and nota.
4. Bennarella bicoloripennis Muir, male genitalia.

A NEW SUGAR-CANE TINGITID FROM JAVA AND SUMATRA (HEMIPTERA)

BY CARL J. DRAKE
Ames, Iowa

Abdastartus sacchari Drake, new species

Very closely allied to *A. tyrianus* Distant, but differing in the longer basal segment of antennæ, longer antennæ, slightly wider paranota, and more deeply emarginate anterior margin of pronotum. Head and anterior portion of pronotum very strongly reflexed, not lying in same plane as rest of body. Head very deeply inserted in the pronotum, the base of the eyes touching collum, strongly swollen at the base of the anterior spines, with four very long, slender, sharp spines; anterior pair reaching beyond the first antennal segment, parallel or converging apically, their apices testaceous; posterior pair very long, pale testaceous, directed forward, mostly contiguous with head, their apices reaching to near the middle of first antennal segment; antenniferous tubercles large, prominent, testaceous slightly divergent, their tips very slightly curved inwardly. Antennæ long, slender, pale testaceous, the basal portion of first and distal half of last segment brown; proportions (male), 7:4:57:32; (female) 7:4:42:23. Bucculæ long, broad, projecting anteriorly beyond head, closed in front. Rostral channel deep, narrow, open behind; rostrum brown, its apex black, extending between intermediate coxæ.

Pronotum closely and deeply pitted, a little more tumid than in *A. tyrianus*, the collum very strongly reflexed and its anterior margin deeply emarginate, its anterior angles much more acute; carinæ pale testaceous, slightly thicker; lateral margins slightly more foliaceous, pale testaceous. Elytra considerably longer than abdomen, with the costal area slightly broader and the discoidal area a little longer than in *A. tyrianus*; wings a little shorter than elytra, clouded with fuscous; the entire insect also a little larger and darker in color. Legs long, slender, pale testaceous. Length, 2.60 mm.; width, .64 mm.

Holotype, male, and allotype, female, Randoeblatoeng, Java, July 7, 1923, in my collection. Paratypes, specimens taken with type, Formosa, and one example from Sumatra. This is the species erroneously recorded by the writer (*Philippine Journal Science,* XXXIV, 1927, p. 307), as *Abdastartus tyrianus* Distant from Java and Formosa. The writer is indebted to Mr. W. E. China of the British Museum, London, for sketches and for comparing *A. sacchari* with Distant's types of *A. tyrianus*.

Abdastartus tyrianus Distant (Fauna Brit. India, Rhynch., Vol. V (Appendix), p. 103, fig. 50), was described from

several specimens, collected by Mr. Max Lefroy, Pusa, Bengal, India. Two specimens are at hand from Sumatra. Antennæ shorter and slenderer than in the foregoing species, the apical portion of terminal segment embrowned. Head less swollen in front; spines long; anterior pair directed forward, almost parallel or divergent, reaching to near apex of second segment. Head and collum very slightly reflexed, the latter moderately concave in front. Antenniferous tubercles prominent, divergent at base, slightly curved inwardly at tips.

The genus *Abdastartus* Distant contains only two species, *A. tyrianus* Distant and *A. sacchari* n. sp. *A. muiri* Drake from Java and India belongs to another genus and will be treated in a subsequent paper.

American Entomology Loses a Distinguished Patron

The death of Dr. William Barnes on May 1, 1930, brought a feeling of personal loss to every entomologist in this country, and more, perhaps, to those connected with the California Academy of Sciences than to many others. For a number of years Dr. Barnes had taken an active interest in the entomological department of the Academy. Most of our species of Lepidoptera have been determined by him, or under his direction, and he has presented authentically determined specimens of several hundred species not otherwise represented in our collection; and for all he did for us he expected and wanted no return other than the satisfaction of assisting in the establishment of an institution that in the future would be an important element in the scientific work of the western states. Dr. Barnes' interest in the Lepidoptera began in childhood and never slacked through a long and active life. His private collection in this order of insects is undoubtedly the largest and best studied collection of North American forms in the world. The 500,000 specimens in his collection represent nearly 8,000 species and include 1915 holotypes and nearly 7,000 other specimens that are really type material. Dr. Barnes had a special building constructed for the collection and for many years employed a trained specialist to care for it, and at all times was most generous in determining material for other students. His death seems an irreparable loss to American Lepidopterology.—E. P. Van Duzee.

STUDIES IN THE MELYRIDÆ, NUMBER EIGHT

BY FRANK E. BLAISDELL, SR.

Stanford Medical School and California Academy of Sciences
San Francisco, California

The very distinct species of *Trichochrous* described below belongs to Casey's second group of species. It is necessary to give a detailed description, as the increasing number of new forms makes it obligatory if the numerous species are to be recognized by description alone. Whenever possible, collectors should secure a moderate series of species in the locality where they are discovered, so as to determine the degree of individual variation. This is exceedingly essential so as to eliminate guesswork in the definition of species.

Trichochrous quadrinotatus Blaisdell, new species

Form oblong, slightly oval. Color black, trophi slightly rufo-piceous, tarsi and distal half of tibiæ rufous to piceous. Surface more or less shining and without metallic luster.

Pubescence not dense nor coarse, moderately short, not completely recumbent and pale in color; brownish to blackish and somewhat coarser hairs form two more or less quadrate spots on each elytron, the subbasal macules most so, while the larger at apical third tend to diffuse both toward apex and anteriorly, connecting more or less narrowly or more broadly with the subbasal; occasionally the brownish hairs become more diffused and nearly replace the pale hairs. Hairs of the pronotal disk and head more or less brownish; on the deflexed sides of elytra, especially toward apex and on apical declivity, they become coarser and semi-erect; bristling erect setæ entirely absent. Lateral pronotal fimbriæ moderately short, regular and evenly close-set, pale to blackish in color; those of the elytra a little longer, quite even and more widely spaced, directed obliquely postero-laterad. Pubescence of undersurface of body fine, closely recumbent and more plumbeous in color; that of sternal side pieces a little coarser and more cinereous.

Head slightly transverse, in width about equal to the pronotal length and apical width, muzzle short; frons plane, surface very finely and microscopically reticulate, finely rugulose in clypeal region and there with a slight glabrous convexity, limited at times by feeble lateral depressions; punctures small, evenly and rather widely spaced, separated by a distance equal to two or three times their diameter. Eyes large, oval, evenly convex and prominent, rather finely faceted. Antennæ less than moderately stout, about as long as head and pronotum; third joint smallest, intermediate

joints slightly serrate anteriorly, outer four more rounded, gradually and evenly incrassate.

Pronotum transverse, widest at basal third or about middle, about a half wider than long and two and a half times longer than an eye, moderately and evenly convex from side to side; apex feebly and broadly arcuate in circular arc, apical angles rounded; sides moderately arcuate, straighter and more convergent before basal third, thence more strongly and more or less briefly sinuate before the small obtuse basal angles, margin finely crenulate; base broadly and moderately arcuate, slightly sinuate within the angles; disk more or less microscopically rugulose, more densely and strongly so in lateral fourth, punctures small in the central area, separated by a distance equal to one to three times their diameter.

Elytra oblong, about two-sevenths longer than wide, three times as long as pronotum and about a sixth wider; humeri broadly rounded, slightly prominent and somewhat tumid; sides parallel, feebly and very broadly sinuate behind humeri, thence feebly arcuate, becoming more evenly so to parabolically rounded apex; disk slightly convex on dorsum, becoming more strongly and declivously so laterally, very gradually declivous apically; punctures coarser than on pronotum and separated by a distance equal to one to three times their diameter, surface somewhat rugose, smoother and punctures smaller toward apex.

Undersurface of body very finely and more densely punctate. Legs moderate in length and slenderness; femora not stout, tarsi somewhat stout and about equal to their tibia in length, the latter quite as long as the femur, similar in the sexes.

Male. Pronotum more broadly arcuate at sides, widest about middle; antennæ slightly heavier; elytra rather more oblong and parallel; fifth ventral abdominal segment truncatosinuate at apex.

Female. Pronotum usually widest at basal third; elytra very slightly wider posteriorly; fifth ventral broadly but not strongly arcuate at apex.

Measurements. Length (types), 2.5-2.7 mm.; width, .9-1 mm. Largest female of the series measures length, 3 mm.; width, 1.2 mm.

Holotype, male (No. 2969), and allotype, female (No. 2970, Museum California Academy of Sciences), and paratypes in my collection; also in that of Mr. Warwick Benedict (Museum University of Kansas).

Type locality: Idylwild, Riverside County, California. A series of twenty-five specimens collected by Mr. Benedict on May 29, 1923.

In the series at hand the brown hairs of the upper surface at times by diffusion reduce the paler pubescence to a minority.

In typical individuals the four dark areas on the elytra are distinctly quadrate with a minimum amount of diffusion.

Quadrinotatus is to follow *vilis* Casey in our lists. By the dark discal elytral macules it differs radically from other members of Casey's second group of species. At first sight it might be associated with *insignis* Casey and *curticollis* Casey on account of the elytral pattern, but those species have the body bristling with long erect setæ and belong to Casey's third group in which there is no regular close-set fimbriæ on lateral margins of pronotum.

TRICHOCHROUS PUNCTIPENNIS Lec.

The type locality of this species is Santa Catalina Island off the coast of Los Angeles County. My own series was collected at Avalon on that island. Mr. Warwick Benedict of the Entomological Department of the University of Kansas has recently submitted to me for study a series of fourteen specimens, taken by him at Ensenada, Lower California. They were collected on July 19, 1924. This is the first record of the species having been taken on the mainland.

LISTRUS NIVEICANTHUS TINCTICORNIS Blais.

The type specimens of this subspecies were taken at Pasadena, California. A considerable series has very recently been sent me for examination that were collected at Warner's Hot Springs, San Diego County, by Mr. Benedict. The differential characters have been fully discussed by me in my paper published as one of the Stanford University publications, Univ. Series Biol. Sciences, Vol. I, No. 3, June 1921, p. 169.

IN MEMORY OF MR. N. R. GUNN

In the death of Mr. Norman R. Gunn the San Francisco Butterfly Club has lost one of the most enthusiastic of its younger members. Mr. Gunn was born at Breckenridge, Minnesota, June 27, 1913. He was a student at the Berkeley High School and had planned to make entomology his life work, intending to carry on his entomological studies at the University of California. His death at Tacoma, Washington, on July 27, 1930, was due to a heart attack while in bathing. The heartfelt sympathy of his entomological associates is extended to the bereaved mother and relatives.—R. F. Sternitzky.

RACES OF TRICHOGRAMMA MINUTUM

BY STANLEY E. FLANDERS

Citrus Experiment Station, Riverside, California

According to Howard and Fiske, the "pretiosa-like" form of Trichogramma is made up of two races, one arrhenotokous and the other thelyotokous.

Marchal found that the thelyotokous race near Paris differed in color from those obtained in central France, and he suggested that if observations were made on Trichogramma from various localities a number of strains would be found having the status of races or elementary species.

In North America a thelyotokous race of Trichogramma is yet to be observed. Differences in color, however, have been observed ranging from "black" to light lemon yellow. The "black" race studied by Martin is dark fuscous throughout. It is unique in that the males normally have vestigial wings.

In a paper presented at the Ithaca Congress in 1928 the writer called attention to the fact that the coloration of the females varied with the developmental temperatures from light yellow to the dark color characteristic of the male. The color of the males is much less affected by temperature.

Peterson first noted that a race existed the females of which did not become yellow when reared at high temperatures. He also found that the two races did not interbreed and that the light race appeared to be typically northern, the dark race southern.

In studying the strains of Trichogramma from various localities in North America, the writer segregated them according to color and life cycles into five races. These maintain their distinctive characteristics when reared under the same conditions for generations.

Only the minutum-like form of Trichogramma which is arrhenotokous and normally has winged males is included in the classification.

The specimens used were all reared in the eggs of *Sitotroga cerealella* at constant temperatures. Hoyer solution was used

for the mounting medium. The observations on the color of the specimens were made against a white background.

The length of the life cycle of each race differs from the others. When reared at a constant temperature of 60 degrees Fahrenheit the differences are very apparent. The races are listed below in the order of their lengthening life cycles:

1. Dark short-cycle race (from west coast of Mexico and southern California):
   A form having dark gray and yellow pigments present at all temperatures. (Life cycle at 81 degrees Fahrenheit is seven days.)
2. Yellow race (from Massachusetts, Illinois, and California):
   A clear yellow form having dark gray markings only when reared at a temperature less than 70 degrees Fahrenheit.
3. Transition race (from California):
   A yellow form having dark gray markings except when reared at 90 degrees Fahrenheit or above.
4. Gray race (from Louisiana and Georgia):
   A form like the dark races except that the pigmentation is less dense. The yellow pigment often is absent in both male and female when reared at 90 degrees Fahrenheit so that the adult appears silvery gray with dark gray markings. (Life cycle at 81 degrees Fahrenheit is eight days.)
5. Dark long-cycle race (from California and Massachusetts):
   A form like the dark short-cycle race except that head capsule retains fuscous markings at all temperatures and the life cycle at 81 degrees Fahrenheit is eight days.

The races with the shorter life cycles appear to have higher optimum developmental temperatures.

The material for this preliminary study was received through the kind coöperation of C. H. Alden, C. O. Bare, William G. Bradley, H. J. Franklin, W. P. Flint, Dr. Philip Garman, E. A. Maier, Dr. Herbert Spencer, W. J. Schoene, and R. W. E. Tucker.

NEW CORIXIDÆ FROM WESTERN NORTH AMERICA (HEMIPTERA)

BY H. B. HUNGERFORD

Department of Entomology, University of Kansas, Lawrence

In reporting some new species of Corixidæ from the western part of North America, I take this occasion to designate two new groups.

Krizousacorixa Hungerford, genus new

Surface nonrastrate. Eyes small, separated from the margins of the head by a comparatively wide space. Rostrum small, transversely wrinkled. Fourth segment of antenna less than half the length of the third. Lateral lobe of prothorax a little longer than broad, the superior margin a little shorter than the inferior one, deep set, its base nearly obscured by the side of the head in front and the inflated margin of the mesothorax behind. Male strigil right. Legs comparatively short. Anterior femora of the only known species inflated, with large patch of stridular pegs at base.

Genotype *Corixa femorata* Guérin, the type of which I have seen in the Paris Museum. A drawing of the head and front legs of this species was published by me on Plate I in the *Bulletin of the Brooklyn Entomological Society*, Vol. XX, No. 1, 1925.

This curious genus appears to stand quite alone. The wide space separating the rear margin of the eye from the rear margin of the head is in common with Graptocorixa, Cymatia, and Glænocorisa. From these it is separated by the relatively small eyes and by a very different pala in the males.

Graptocorixa Hungerford, genus new

Surface of hemelytra rastrate, transversely marked with undulate bands. Eyes prominent, a facial area pubescent, face short, rostrum small. Space beneath the lateral margin of the eye wide. Postocular space wide. Fourth segment of antenna less than half the length of the third. Lateral lobe of prothorax quadrate to rectangular with anterior distal angle incurved and posterior (upper) part usually thickened, mesoxyphus bilobate at tip. Dorsum of abdomen more or less red. Male strigil right and in size varying from minute to large. Legs comparatively short and stout. Anterior pala falcate terminated by a stout claw.

Genotype *Corixa abdominalis* Say. To this genus also belong: *Corixa serrulata* Uhler, *Corixa melanogaster* Kirk.

(= *Corixa unguiculata* Champ.), *Arctocorixa californica* Hungerford, *Arctocorixa uhleri* Hungerford, and *Arctocorixa gerhardi* Hungerford.

This genus has some relation to Cymatia Flor. and Glænocorisa Thoms. It agrees with them in having the fourth segment of the antenna less than half the length of the third and in having a broad postocular space on the head. Like Cymatia Flor, it possesses a strong claw on front pala, but does not have a smooth rostrum as in Cymatia.

The distribution of this group is distinctly southwestern North America. The records from specimens in the Kansas University entomological collections are as follows:

GRAPTOCORIXA ABDOMINALIS Say

Sutton County, Texas; Presidio County, Texas; Valentine, Texas; Alpine, Texas; Palo Verde, Imperial County, California; Espirita Santo Island, Gulf of California (Calif. Acad. Sci.); Organ Mountains, New Mexico; Mexico; S. E. Kane County, Utah; Catalina Mountains, Arizona; Hot Springs, Arizona; Warsaw, Arizona; Superstition Mountains, Arizona; Quartzside, Arizona; Culberson County, Arizona; Sabino Basin, S. Catalina Mountains, Arizona; Cochise County, Arizona; Gila County, Arizona (many of these approach the variety *bimaculata* Guér.); Yavapai County, Arizona; Santa Cruz, Arizona; Oracle, Arizona (Calif. Acad. Sci.); Yuma County, Arizona (Calif. Acad. Sci.).

GRAPTOCORIXA ABDOMINALIS, var. BIMACULATA Guér.

Mitla, Mexico; Mexico; El Paraiso, Lower California, Mexico; Colima, Vulcano, Mexico; Guatemala; Costa Rica.

GRAPTOCORIXA SERRULATA Uhler

San Antonio, Mexico; Valentine, Texas; Presidio County, Texas; Gila County, Arizona; Santa Cruz County, Arizona; Yavapai County, Arizona; Cochise County, Arizona; Oracle, Arizona (Calif. Acad. Sci.).

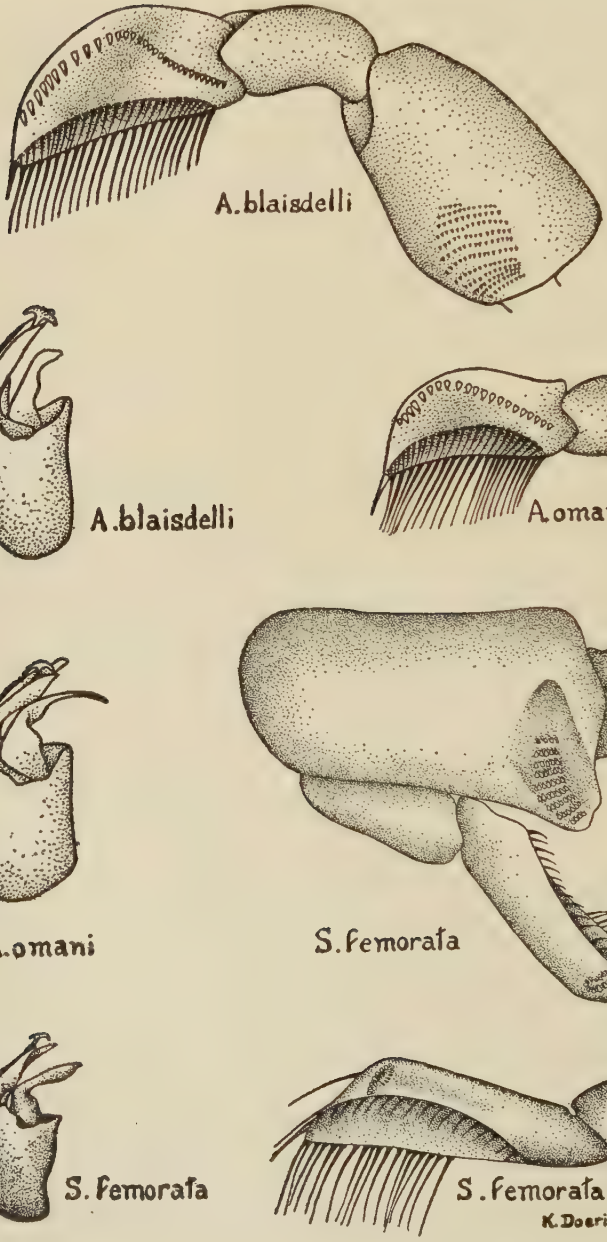
GRAPTOCORIXA UHLERI Hungerford

Described from California. Some from Monrovia Canyon, California, differ slightly from the types.

Descanso, California (Calif. Acad. Sci.); Santa Cruz Island, California (Calif. Acad. Sci.).

GRAPTOCORIXA CALIFORNICA Hungerford

San Jacinto Mountains, California; "Californie Lansweert"; Pasadena, California; San Diego County, California; Huntington Lake, California (Calif. Acad. Sci.).


A.blaisdelli
A.blaisdelli
A.omani
A.omani
S.femorata
S.femorata
S.femorata
K.Doering del.

GRAPTOCORIXA GERHARDI (Hungerford)

Santa Cruz County, Arizona; Musquiz Canyon, Fort Davis, Texas; Brewster County, Texas. (These are slightly different from the types.)

GRAPTOCORIXA MELANOGASTER (Kirkaldy)

Costa Rica, Mexico.

It is interesting to note that this genus appears to have a wider range than my Neocorixa which has been taken only in Gila County, Arizona, and Torance County, New Mexico. In some ways Neocorixa and Graptocorixa have a common resemblance. In the one the strigil of the male abdomen is on the left side, and in the other it is on the right side. I cannot find any indication of the curious abdominal asymmetry in Graptocorixa that is possessed by the females of Neocorixa.

Arctocorixa omani Hungerford, species new

Size. Length, 6.6 mm. Width across head, 2.25 mm.

Color. General facies medium brown. Distinct barring on pronotum and basal half of clavus, nine to ten dark bands on pronotum. The pale bands broader than the dark ones on basal half of clavus, pattern on remainder of hemelytra reticulate, sometimes confused with only a suggestion of cross-line effect, except embolium which is sooty brown to black. Vertex, face and limbs light, venter more or less dark.

Structural characteristics. Pronotum and clavus rastrate. Head and pronotum short. Interocular space appearing a trifle narrower than an eye. Metaxyphus about as long as wide, of the usual triangular shape. Male facial fovea shallow, not attaining the eyes laterally. Male pala of usual form as shown by Figure 3 on Plate 1, with twenty-one pegs in the row. Strigil of average size, a little longer than wide, composed of six striæ, the outer one incomplete. Male genital capsule as shown in Figure 4.

Described from thirty-four specimens from Carson City, Nevada, August 9, 1929, taken by R. H. Beamer. Holotype, allotype, and some paratypes in University of Kansas collection. Paratypes also in United States National Museum and the California Academy of Science.

I have to report this species also from: Phillips Station, Eldorado County, California, July 24, 1921, 7000 feet elevation, collected by F. E. Blaisdell (Calif. Acad. Sci.); Mono Lake, California, May 12, 1917, C. L. Fox collector (Calif.

Acad. Sci.); Mount Kaiser, California, July 19, 1919, Fresno County, 10,000 feet., F. C. Clark collector (Calif. Acad. Sci.); Eagle Lake, Lassen County, California, July 31, 1921, J. O. Martin collector (Calif. Acad. Sci.); Vancouver Island, August 8, 1898, G. W. Taylor collector (E. P. Van Duzee); Chilliwack, B. C., September 20, 1925.

Arctocorixa blaisdelli Hungerford, species new

Size. Length, 8.4 mm. Width of head, 2.7 mm.

Color. General facies of usual sort. Eight to ten dark bands on pronotum. Pale bands slightly wider than the dark. Cross banding of hemelytra entire only on base of clavus, elsewhere broken but transverse somewhat undulate figures, the pale ones more slender than the dark. Head and limbs pale, venter more or less dark.

Structural characteristics. Pronotum and clavus rastrate. Vertex of head slightly higher than the eye. Facial fovea of male marked, not attaining the eyes laterally. Metaxyphus slender. Front leg of the male as shown in Figure 1 on Plate. A stridular patch of about a dozen rows of pegs on base of front femur and thirty to thirty-two pegs in the palar row. These pegs increase in size from the base. Strigil of male rectangular and transverse, of fifteen striæ. Clasper of male as shown in Figure 2 on Plate.

Described from the following series: Seven specimens, Vine Hill, Contra Costa County, California, July 5, 1911, collected by F. E. Blaisdell. Holotype in collection of California Academy of Science. Other specimens of this species as follows: San Francisco, California, July 9, 1911, E. C. Van Dyke, two specimens. Six specimens, Lagunitas, Marin County, California, June 25, 1924, E. H. Nast, collector. Two specimens, Berkeley, California, September 23, 1915, collected by E. C. Van Dyke.

Some other records worthy of noting are as follows: *A. utahensis* Hungerford, Red Lake, altitude 10,500 feet, Fresno County, California; taken by E. C. Van Dyke (Calif. Acad. Sci.). *A. wileyi* Hungerford, Steen Mountains, Harvey County, Oregon, June 23, 1922, E. C. Van Dyke (Calif. Acad. Sci.). Eagle Lake, Lassen County, California, July 31, 1921, J. O. Martin (Calif. Acad. Sci.). San Diego County, California, Poway Valley, April 9, 1930, C. and D. Martin. (Some of these specimens are nearly black.)

CALIFORNIA MICROLEPIDOPTERA IV

BY H. H. KEIFER

Sacramento, California

These are four species of the family Gelechiidæ. The first is a small species which runs to the genus Epithectis in Meyrick's key (Genera Insectorum, fasc. 184), and which does not fit the description of any recorded species. The white subapical fascia and apical markings are the apparent features of this species.

Epithectis californica Keifer, new species

Second joint of palpi grayish fuscous, unevenly whitish on inner side and above, and narrowly white at apex; terminal joint whitish, extreme base fuscous and entire anterior edge and tip blackish. Antennæ dark fuscous, somewhat whitish below, especially basally. Head, thorax, abdomen and legs shining gray. Ground color of forewing dull white, but entirely overlaid and almost completely obscured by grayish fuscous. Basal half of wing light grayish fuscous with a few indistinct marks. Apical half distinctly darker and contrastingly marked. Costa at extreme base dark fuscous. Fold with a dark fuscous blotch just within the basal fourth, and another at one-third, a white infusion of scales between them and after the second in the fold; the second mark the larger, probably indicating the plical stigma. Discal stigmata dark fuscous, small, indistinct, the first at one-half, the second at the apical third. A short, outwardly pointed and oblique blackish mark on costa above first discal stigma, followed by a white infusion and then the dark fuscous edging on the inner side of the white fascia. Fascia rather narrow (angled with apex pointing outward) from costa just beyond two-thirds, extending obliquely outward to just below central line of wing at apical fifth, thence abruptly running back to tornus, slightly interrupted just below angle. Extreme apex with a white dot; evenly spaced between this and the fascia on the costa are two short white marks; a conspicuous black dash contiguous to the lower side of the apical white dot; a white line in cilia around apex; cilia light fuscous. Hindwing whitish overlaid light fuscous, giving a general gray appearance. Expanse, 7½ to 9½ mm.

Type, male, No. 2963, Museum California Academy of Sciences, taken near Fair Oaks, Sacramento County, California, by the writer on September 19, 1928. Allotype, female, No. 2964, Museum California Academy of Sciences, with same data. Forty-one paratypes also have this same locality and date. These paratypes are in the collection of Miss Annette

F. Braun, the United States National Museum, the author's collection, and the Academy collection.

The male genitalia, as shown by paratypes designated in the Academy collection and the author's collection, are chiefly characterized by spines around the ædœagus and the large ventral plates. These ventral plates touch each other midventrally and are emarginate apically, ending in a short midventral projection and a longer finger-like process opposite the shorter projection, just below each harpe (see Figs. 1a, 1b). The male genitalia of a specimen of *E. attributella* Walk. furnished by Miss Braun have been examined. In this species there is a suggestion of the ventral plates as in *californica,* the ædœagus is similar to the local species, and the harpes are about as long though differently shaped; but the uncus and gnathos are radically different. Specimens from Oroville and Marin County which cannot be separated from *californica* by wing pattern have genitalia markedly at variance with the Sacramento County form and therefore are not included at the present. They may prove to be members of one quite variable species.

The next three species are of the type genus and are associated in having the same or closely related food plants. These plants are of the Ericaceæ and are Madrone (*Arbutus manziesii* Pursh.) and Manzanita (*Arctostaphylos* spp.). The moths differ according to the following synopsis:

ADULTS

A. Almost entirely reddish or brick red; male genitalia with a short broad uncus and harpes apparently double..... ..... *Gelechia panella* Busck

B. Grayish black with bluish or purplish reflections and a black rather elongate triangle on dorsal base of forewings; male genitalia with uncus slender and produced, harpes simple, vinculum with large median posterior lobe..... ..... *Gelechia arbutina* n. sp.

C. Grayish black with bluish or purplish reflections and an outwardly oblique black bar across central line of wing near base; male genitalia with uncus produced and slender, harpes simple, vinculum with two posterior lobes..... ..... *Gelechia manzanitæ* n. sp.

LARVÆ

A. Yellow green with three prominent dorsal longitudinal pinkish purple stripes; found on Manzanita and Madrone..... ..... *Gelechia panella* Busck

B. Yellow green, noticeably irrorated with fine black dots; found on Madrone only.....*Gelechia arbutina* n. sp.

C. Yellow green with a reddish purple subdorsal longitudinal stripe, or this stripe fuscous (sometimes faint and shortened); found on various species of Manzanita....*Gelechia manzanitæ* n. sp.

Gelechia arbutina Keifer, new species

The scales of this moth are light in color at the extreme base, almost white, but heavily pigmented dark grayish or blackish on most of the scale, which is often tipped a lighter shade. The general effect is deep gray with black spots and a bluish, coppery or purplish irridescence.

Palpi with second joint dark grayish fuscous, brush large, longer at base, irrorated whitish, the joint somewhat overlaid whitish on inner side posteriorly, especially near base; terminal joint blackish fuscous, irrorated and marked whitish or ochreous whitish: an annulus just above base, tip white. Head deep grayish fuscous, face on some specimens lighter; thorax as head above, the lighter irroration not very contrasting. Abdomen sordid whitish, darker toward tip and below. Forewing the same as the head and thorax, but with more contrasting irroration, scale tufts, and black marks, and a white subapical fascia. A small black spot within the costa near base, often followed by two or three more. A comparatively large deep black triangle near dorsal base, somewhat elongate longitudinally, its inner and most attenuate point touching dorsal edge near base, its outer angle ending in the fold and partly on the edge of a scale tuft by the fold at basal fourth, the costal angle ending a short distance across the fold and near central line of wing. A second tuft at basal third on disk; a third, small, obliquely below and beyond second, on the fold. A conspicuous moderately narrow whitish fascia, slightly curved or angled, extends from costa, just after beginning of costal cilia, to tornus. A large blackish area from the last two scale tufts to the fascia, the costal edge of this area extending from well within costa near the second scale tuft to the costa at or just before the fascia, the dorsal edge somewhat concave but roughly following the fold to tornus. Apical area beyond the white transverse fascia somewhat darker than the usual wing color, with suggestions of longitudinal stripes, the most notice-

able directly from the fascia to just below the apex. Cilia light gray, faintly lined parallel to wing margin. Hind wing light fuscous, darker apically; cilia light fuscous. Legs dark fuscous or grayish fuscous, irrorated whitish, and white at apices and joints. Expanse, 19 to 22 mm.

Type, male, No. 2965, Museum California Academy of Sciences, reared June 7, 1929, from a larva collected on *Arbutus menziesii* Pursh (Madrone) at Mill Valley, Marin County, California; allotype, female, No. 2966, Museum California Academy of Sciences, reared June 12, 1927, from a larva with the same data. A series of eighteen paratypes are included, part of them reared from Mill Valley larvæ and part from Phoenix Lake (Marin County) larvæ. There are also collected adults, all from Mill Valley, part taken by Mr. E. P. Van Duzee. These are in the collections of Miss Braun, the National Museum, the Academy, and the author.

The male and female genitalia as shown by certain designated paratypes are diagrammed in Figs. 2a, 2b, 2c, 2d. The main features of the male genitalia are the produced uncus, the gnathos, the ventrad projections of the tegumen, the large midventral posterior lobe of the vinculum, and the shape of the ædœagus. This is compared under the next species.

The larva is comparatively robust and approximately 17 mm. long when full grown. Body yellowish green; tubercles indicated as small conspicuous black dots; hairs moderately long, prominent, black; body generally becoming bright pinkish before pupation. Thoracic shield more yellowish or ochraceous than the body, variously shaded with black usually along the lateral or posterior margins. Anal plate more yellowish than body; anal fork present. Thoracic legs light yellow, dark fuscous on tibia and tarsi. Crochets in complete circle, heavier outwardly, unevenly triordinal, apparently 55 to 60. Head light brown or yellow-brown, eyes blackish brown.

This larva is typically found in a roll at the outer edge of that portion of the leaf it is skeletonizing. This roll is securely anchored, is open at both ends, and is made larger as the larva grows. The leaves first attacked are those that had developed the previous year, as the new growth has not appeared when this caterpillar begins to feed in the early spring. The habits

of the mature larvæ are not known from field observations, but they live between new leaves in the laboratory. They are to be collected in Marin County, at Mill Valley and Phoenix Lake, during March, April and possibly May; collecting dates are from March 19 to April 16.

Gelechia manzanitæ Keifer, new species

This species is very similar to the foregoing and does not need to be described in detail as most of the description would be a reiteration of that of *arbutina*. The main difference in the pattern of the forewings is on the basal part of the wing where instead of a black triangle there is an oblique black bar, from well within the costa at the basal fifth it runs across the fold and ends on the outer side of a scale tuft well within the dorsal margin at about the basal fourth. In addition the apical joint of the palpi is not as white, especially at the tip. Wing expanse of the various specimens is from 15 mm. to 19.5 mm, averaging somewhat smaller than *arbutina*.

Type, male, No. 2967, Museum California Academy of Sciences, reared June 26, 1927, from a larva collected by the writer at Phoenix Lake, Marin County, California, feeding in a new terminal of *Arctostaphylos* sp. (manzanita). Allotype, female, No. 2968, Museum California Academy of Sciences, reared June 30, 1927, from a larva having the same data. In addition sixty-nine paratypes are included: from Phoenix Lake, the Marysville Buttes, Sutter County, Calif., and Big Bend Mountain (above Las Plumas), Butte County, Calif. These are distributed among the collections of Miss Braun, the National Museum, the Academy, and the author.

This large series of adults from these widely separated localities shows considerable variation in size and in larval coloration, but the color of the adults does not vary, nor do the genitalia to any extent. Those from Phoenix Lake average about 18.5 mm. in wing expanse, whereas the other two groups from the inland localities average 16.5 mm. Adults from Phoenix Lake larvæ emerged from June 15 to 30; Marysville Butte larvæ appeared as adults from May 31 to June 15; the Big Bend Mountain individuals came out about the same time as those from Phoenix Lake.

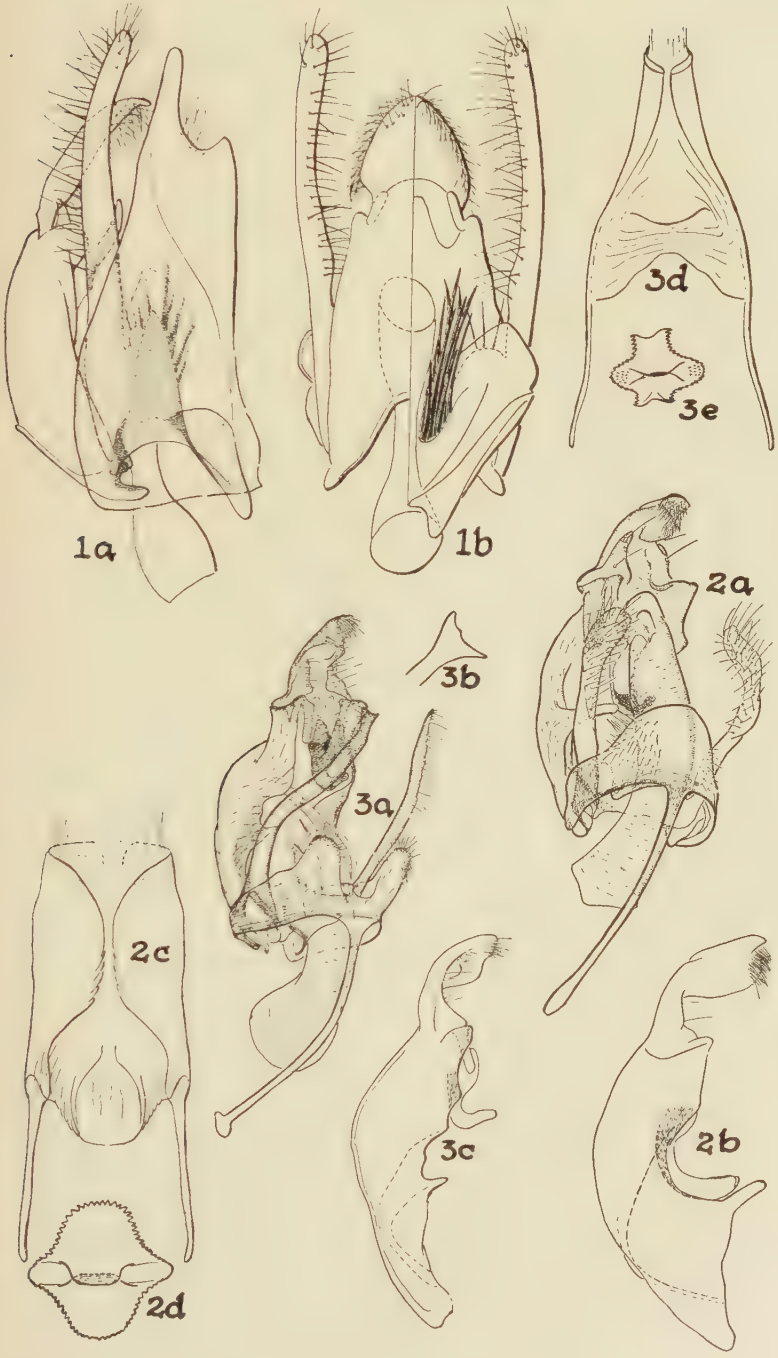
The male genitalia of this species (Figs. 3a, 3b, 3c, 3d, 3e) can immediately be seen to differ from that of *arbutina*: 1. In the shape of the uncus and gnathos; 2. In the shorter projections from the tegumen; 3. In the two ventral lobes of the vinculum; 4. In the shape of the ædœagus. The male genitalia of specimens of *Gelechia scabrella* Busck received from Dr. William Barnes have been examined and proves that species to belong to the same section of the genus as the new species, the main differences being only in degree. *Gelechia walsinghami* Dietz and *pennsylvanica* Dietz seem also to belong to this series, but can immediately be separated by the pattern of the forewings.

The larvæ of *manzanitæ* were collected May 14 to 30 at Phoenix Lake, April 20 to May 11 at the Marysville Buttes, and May 23 to 28 on Big Bend Mountain. At least three species of *Arctostaphylos* are attacked in this range. On April 26 the larvæ were found skeletonizing the old leaves, as the new growth had not yet appeared. The mature larvæ are found in spune heads of new growth, eating holes in the leaves.

A Phoenix Lake larva when full grown and not yet ready to pupate is from 13 to 14.5 mm. long; body light yellow green, with a subdorsal reddish or reddish purple longitudinal stripe from the thoracic shield to the ninth abdominal segment; a few of the body tubercles slightly fuscous; hairs moderate in length, brownish fuscous; thoracic shield brown and blackish laterally, or black with a narrow median line; crochets in complete circle, heavier outwardly, 45 to 47, unevenly triordinal. Head dark brown to black.

The Marysville Butte larvæ are smaller in average and about the same in color except that the subdorsal stripe is indicated by an almost faint fuscous color. The Big Bend Mountain larvæ are, if anything, still smaller, some only 12 mm. long when full grown; the head and shield is never black and the subdorsal stripe is only shortly indicated on part of the individuals by faint fuscous shading.

The pupæ of *manzanitæ* and *arbutina* are very similar; that of *manzanitæ* being 6.5 to 8 mm., and *arbutina* 8 to 8.5 mm. They are dark brown, robust, the usual hair fringe on the


1a
1b
3d
3e
2a
3b
3a
2c
2d
3c
2b

seventh segment, and no movable segments. In *manzanitæ* the antennæ, wings and legs end near the posterior margin of the fifth abdominal segment, while in *arbutina* they end about the middle of the segment.

Gelechia panella Busck

This species appears here by virtue of its food plants. An adult was obtained from Manzanita in Marin County during 1927, but the larva was not noted until specimens were taken from both Manzanita and Madrone on Big Bend Mountain, May 23 and 28, 1928.

The length of the full-grown larva of this species is approximately 16 mm. Head light yellow or yellow-brown; body yellow-green with three dorsal longitudinal (a dorsal and a subdorsal) rather wide pinkish purple stripes. The larva appears with the new growth in the spring considerably after the appearance of the two above-described species, and feeds on both Manzanita and Madrone. The adult is interesting in that it displays the reddish coloring common to a number of Manzanita insects, which include members of the Coleoptera and Hemiptera. The male genitalia would place *panella* in another section of the genus than that of *arbutina* and *manzanitæ*. The distribution in California of this species as shown by specimens in the Academy collection is: Alma, Santa Cruz County (J. O. Martin, collector); Mill Valley, Marin County (E. P. Van Duzee and M. C. Van Duzee, collectors); Phoenix Lake, Marin County (reared by the writer); and Big Bend Mountain, Butte County (reared by the writer). The adults taken on the wing were collected from March to October, proving the species to overwinter in the adult stage. The reared specimens have emergence dates from June 22 to June 29.

Explanation of Plate

1a, *Epithectis californica,* lateral view of the male genitalia. 1b, *same,* composite dorsal and ventral view of the male genitalia, ventral view on right. 2a, *Gelechia arbutina,* male genitalia. 2b, *same,* side view of uncus, gnathos, and tegumen of male genitalia. 2c, *same,* basal part of the female genitalia. 2d, *same,* signum of female genitalia. 3a, *Gelechia manzanitæ,* male genitalia. 3b, *same,* variation in tip of harpe. 3c, *same,* side view of uncus, gnathos, and tegumen of male genitalia. 3d, *same,* basal part of female genitalia. 3e, *same,* signum of female.

THE DIPTEROUS GENUS SYMPYCNUS LOEW IN NORTH AMERICA AND THE WEST INDIES

BY M. C. VAN DUZEE

Buffalo, New York

The described species of Sympycnus and its subgenus Calyxochætus are distributed over the whole world. Including those described in this paper, 156 species have been recognized. These are distributed about as follows: European 12; Oriental, including most of Asia, 32; North America 24 and 12 species of the subgenus Calyxochætus; Central America 10 and 2 species of Calyxochætus; South America 47 and 2 species of Calyxochætus; Africa 9 and one species of Calyxochætus; Australia and New Zealand 6 species. In South America, below the 38 degrees south latitude, nearly half of the known species of the Dolichopodidæ belong to this genus; this is probably partly due to ecological conditions in the regions where most of the collecting has been done.

The genus Sympycnus was established by Dr. Hermann Loew in 1857, Neue Beitr., v, p. 42, for five species; generic type designation by Coquillett in 1910, *Porphyrops annulipes* Meigen (Proc. U. S. Nat. Mus., Vol. xxxvii, p. 610). The genus Calyxochætus was erected by J. Bigot in 1888, Ann. Soc. Ent., France, Ser. 6, viii, Bulletin p. xxiv, 1888, and Ann. Soc. Ent., France, Ser. 6, x, p. 282, 1890, with type *Sympycnus nodatus* Loew.

Synonyms: Nothosympycnus Wheeler, Proc. Calif. Acad. Sci., Ser. 3, Zoöl., Vol. ii, pp. 47, 51, 1899, type *Sympycnus nodatus* Loew; Gymnoceromyia Bigot, Ann. Soc. Ent., France, Ser. 6, x, pp. 276, 293, 1890, type of genus and only species *Gymnoceromyia andicola* Bigot.

As Nothosympycnus includes the type species of Calyxochætus, there can be no question as to its being synonymous; Gymnoceromyia has been considered a synonym of Psilopus, but lately I described a species as a Sympycnus (Calyxochætus) from Chile, but when the type was returned to the British Museum Mr. Edwards and Mr. Collin compared it with the type of *Gymnoceromyia andicola* Bigot and found them the same. As it is a true Calyxochætus, we must place Gymnoceromyia also as a synonym of Calyxochætus. This subgenus

is separated only by having the first joint of fore tarsi shorter than fifth, and not or but little longer than wide, but it is shortened in the male only; the male also has the tip of the arista enlarged in some species, but as we have a South American species with three enlargements on the arista and the first joint of the fore tarsi longer than the second, it seems necessary to make this a subgenus if we can give it even that rank.

The genus Sympycnus is characterized as follows: Face narrow or somewhat narrowed in the male, wider in female, usually a little wider above; first antennal joint bare above, third joint usually small, triangular, pointed at tip with the arista inserted near the base on upper edge; legs and feet slender, tibiæ with rather small bristles, sometimes almost without bristles; pulvilli often enlarged in the male; abdomen elongated, cylindrical, somewhat compressed in the male, tapering to a point in the female; hypopygium of male more or less embedded, small, its appendages usually small, triangular or rod-like; dorsum of thorax with a more or less distinct flattened area on posterior slope, before the scutellum; acrostichal bristles usually in a single row, rarely biserial or even wanting; abdomen with six segments in the male, sixth small and usually not visible on the venter; female with five visible segments; wings rather long and narrow, sometimes much narrowed at base in male, usually wider in the female with the anal angle more prominent; posterior cross vein at or a little before the middle of the wing; third and fourth veins parallel toward their tips, sometimes parallel from the cross vein, but usually the last section of fourth vein is more or less bent at or before its middle, fourth vein ending in or a little before the apex of the wing; sixth vein not reaching the wing margin, sometimes represented by a slight fold in the wing.

Some species vary considerably from the characters given above. Several have the third antennal joint large or the arista inserted near the middle of upper edge; in a few the abdomen is shorter and formed more as in the Chrysotus and in several the hypopygial appendages of the male are very long and narrow, nearly as long as the abdomen.

I am greatly indebted to Dr. J. M. Aldrich for the loan of material from the United States National Museum, from which several species new to me are described.

KEY TO THE MALES OF THE NORTH AMERICAN SPECIES OF SYMPYCNUS, INCLUDING MEXICO AND THE WEST INDIES

1. Species with all tarsi plain, except sometimes in color or with a few longer hairs on last joint..... 2

— Species with one or more pairs of tarsi modified, or with unusual hairs or bristles, sometimes only the last joint a little widened 13

2. Antennæ wholly black or brown, sometimes first joint a little yellow below 3

— Antennæ yellow or brownish yellow, at least first joint yellow 8

3. Fore coxæ black with yellow tips (California; Alaska) ..... *cuprinus* Wheeler

— Fore coxæ wholly, or almost wholly yellow 4

4. Dorsum of thorax with a broad, median, violet stripe (Ontario; New York) ..... *canadensis* Van Duzee

— Thorax without such a stripe 5

5. Middle and hind coxæ black with yellow tips; first and second joints of hind tarsi of nearly equal length (Mexico) ..... *varipes* Aldrich

— All coxæ wholly yellow; first joint of hind tarsi shorter than second 6

6. Dorsum of thorax with distinct lines; third antennal joint twice as long as wide (Eastern States to Kansas) ..... *lineatus* Loew

— Dorsum of thorax without lines; third antennal joint short, not longer than wide 7

7. Dorsum of thorax dull; third antennal joint as long as wide; hypopygial lamellæ short and stout; abdomen rather short (California; Washington) ..... *breviventris* new species

— Dorsum of thorax bright shining green; third antennal joint short; hypopygial lamellæ long and narrow; abdomen long as usual (St. Vincent, W. I.) ..... *thoracicus* new species

8. Basal half of first joint of hind tarsi white, apical half black; hind tibiæ enlarged at tip, which is sharply black (Colorado; New Mexico; Arizona) ..... *clavatus* Van Duzee

— Hind tarsi not black and white; hind tibiæ scarcely enlarged at tip, which is sometimes a little brown 9

9. Humeri yellow (Mexico) ..... *angustipennis* Aldrich

— Humeri metallic or brown, sometimes a little yellow below 10

10. Hind tarsi with first joint only a little shorter than second (California) ..... *lævigatus* new species

— First joint of hind tarsi much shorter than second 11

11. Face golden yellow (Alaska) ..... *aurifacies* Van Duzee

— Face not yellow, usually white 12

12. Dorsum of thorax with distinct lines (Eastern States to Kansas) ..... *lineatus* Loew

— Dorsum of thorax without lines (California) ..... *inæqualis* new species

13. Only one pair of tarsi ornamented 14

— More than one pair of tarsi modified or with unusual hairs or bristles 25

14. Fore tarsi modified or with long hairs or bristles, other tarsi plain 15
— Middle tarsi with long hairs or modified, other tarsi plain 19
— Hind tarsi a little compressed and widened, third joint with a prominent spine at tip or with long hairs 20
15. Second joint of fore tarsi dilated on underside of basal half or more; hypopygial lamellæ very long filaments, fringed with long hairs (California) ..... *caudatus* Van Duzee
— Second joint of fore tarsi not swollen below; hypopygial lamellæ short 16
16. First two antennal joints yellow, third black (California) ..... *lævigatus* new species
— Antennæ wholly black, or first joint yellowish below 17
17. Fore tarsi gradually, but considerably widened from base to near tip of second joint, then narrowing again to normal at tip (Utah) ..... *latitarsis* new species
— Fore tarsi not widened in the middle, if at all 18
18. Fifth joint of fore tarsi a little widened, their pulvilli very large (Colorado) ..... *pulvillus* new species
— Second joint of fore tarsi with a spur near tip, and several small bristles on other joints, fifth joint not at all widened, their pulvilli large (California) ..... *breviventris* new species
19. Last two joints of middle tarsi widened, black (Idaho) ..... *montanus* new species
— Second joint of middle tarsi with three long hairs (California) ..... *tripilus* new species
20. First two joints of antennæ yellow, third sometimes blackish; third joint of hind tarsi fringed with long hair (Alaska) ..... *tertianus* Loew
— Antennæ yellow, tip of third joint brown; second joint of hind tarsi with one wavy hair, which is nearly as long as the joint (Indiana) ..... *aldrichi* new species
— Antennæ wholly black or brown 21
21. Third joint of hind tarsi fringed with long hairs, fourth with several hairs which are shorter (Wyoming; Alberta) ..... *marcidus* Wheeler
— Third joint of hind tarsi with a prominent spine at tip 22
22. Hypopygium with elongate, whitish lamellæ and two or three long, black, hair-like filaments 23
— Hypopygial appendages wholly black 24
23. Third joint of hind tarsi shorter than fourth; hypopygial lamellæ very large (Colorado; New Mexico) ..... *calcaratus* new species
— Third joint of hind tarsi as long or longer than fourth; hypopygial lamellæ very short (Victor, Colorado) ..... *setosus* new species

24. Fore coxæ almost wholly black, with black hair; hypopygium round, unusually conspicuous (Colorado)..... ..... *globulicauda* new species

— Fore coxæ almost wholly yellow with pale yellow hairs; hypopygium small, partly concealed (California)..... ..... *fasciventris* Van Duzee

25. All tarsi modified or with unusual hairs or bristles (California) ..... *pugil* Wheeler

— Apical joints of fore tarsi slightly widened; third joint of hind tarsi with a large thorn at tip; fore coxæ, all femora and tibiæ wholly yellow (California).....*fasciventris* Van Duzee

Sympycnus aldrichi Van Duzee, new species

Male. Length, 2 mm. Face green, quite wide above, eyes touching below; palpi and proboscis yellow; antennæ (Fig. 40) yellow, third joint brown at tip, triangular, as wide as long, arista appears yellow in certain lights, brown in others; front dull brownish.

Dorsum of thorax green, dulled with gray pollen; lower part of thorax yellow; abdomen yellow, apical part and the hypopygium shining brownish black; hypopygial appendages very small.

Coxæ, femora, tibiæ and tarsi yellow, with very small hairs and bristles; apical joints of tarsi and tips of some of the other joints blackish; hind tarsi (Fig. 41) with long wavy hair at tip of second joint; joints of fore tarsi as 15-5-5-4-5; of middle ones as 26-12-11-6-6; joints of posterior pair as 18-13-14-9-8. Calypters, their cilia and the halteres yellow.

Wings grayish; third and fourth veins nearly straight and parallel beyond the cross vein, fourth ending in the apex of the wing; last section of fifth vein as 20, cross vein 11.

Described from one male taken by J. M. Aldrich, July 21, 1915, at La Fayette, Indiana. Type in the United States National Museum.

Sympycnus angustipennis Aldrich

Biologia, Diptera, Vol. i, 344, 1901. Mexico.

Male. Length, 2.1 mm. Face very narrow below; front purple in the middle; humeri and posterior margin of pleuræ yellow; abdomen with yellow on the sides near the base; hypopygium with yellow appendages; coxæ, femora and tibiæ yellow, tarsi slightly infuscated; first joint of middle tarsi as long as the remaining four taken together; pulvilli not enlarged; calypters, their cilia and the halteres yellow.

Sympycnus aurifacies Van Duzee

Ohio Journal of Science, Vol. xxiii, 248, 1923. Alaska.

Male. Length, 1.7 mm. Face narrow, golden yellow; front blue or violet; first two antennal joints orange yellow, third black, twice

as long as wide; palpi small, yellowish; dorsum of thorax greenish brown, with a median green line and a poorly defined purple line each side of it; scutellum blue or violet, green on the edge; fore coxæ, all femora and tibiæ wholly yellow; fore coxæ with a few small yellow hairs; all tarsi black from tip of first joint, anterior ones one and a half times as long as tibia, first joint nearly as long as two following taken together; hind basitarsus hardly as long as the second joint; last section of fifth vein twice as long as cross vein; calypters, their cilia and the halteres yellow.

Sympycnus breviventris Van Duzee, new species

Male. Length, 2 mm. Face very narrow; face and front grayish pollinose; palpi black with white pollen; antennæ (Fig. 3) black, seen from below the first joint is yellow, from above it appears wholly black; occiput green with white pollen; lateral and inferior orbital cilia white.

Thorax greenish; dorsum covered with brown pollen, without lines; acrostichal bristles few and very small; pleuræ white-pollinose, its posterior edge more or less yellow. Abdomen green, compressed; first segment yellow at base, second and third shining yellow on sides, leaving a median stripe on dorsum and the hind margin green; hairs of abdomen black; hypopygium (Fig. 5) blackish, very small, with a pair of yellow lamellæ; venter yellow, its last segment black with a pair of large black bristles.

Coxæ yellow, posterior ones sometimes a little blackened; anterior pair with minute yellow hairs; femora and tibiæ yellow; fore tibiæ without bristles, middle and hind ones with a few small bristles; tarsi yellow, more or less infuscated toward their tips; fore tarsi (Fig. 4) with a spur at tip of second joint and with several small bristles on other joints, sometimes these are apparently wanting, second joint and tip of first appear slightly thickened when viewed from the side; joints of fore tarsi as 23-9-8-6-6; of middle ones as 30-14-10-7-5; joints of posterior pair as 16-24-14-8-7. Calypters yellow with black tips and cilia; halteres yellow.

Wings a little grayish; third and fourth veins nearly straight and parallel beyond the cross vein, fourth ending in the apex of wing; last section of fifth vein as 39, cross vein as 15; anal angle of wing quite prominent.

Female. Face wider, color as in the male; abdomen tapering; joints of hind tarsi as 20-21-13-7-8; palpi yellow; venation as in the male.

Described from seven males and seven females, holotype, allotype and seven paratypes taken by the author, April 17, 1915, in San Diego County, California, on the edge of the

Colorado Desert; the other five paratypes were taken by J. M. Aldrich, May 7-9, 1906, at Pacific Grove, California.

Holotype and allotype in author's collection.

Sympycnus calcaratus Van Duzee, new species

Male. Length, 3-3.5 mm. Face silvery white, narrow below; front green, dulled with gray pollen; palpi brown or yellowish brown; antennæ (Fig. 23) black, third joint longer than wide, triangular.

Thorax green, dulled with gray pollen; acrostichal bristles represented by several small hairs before the suture; pleuræ white-pollinose; abdomen green, base of segments bronze or coppery, its hairs mostly black; hypopygium (Fig. 25) black; outer lamellæ large, yellow; inner appendages a pair of small, rounded, black lamellæ, fringed with small hairs.

Coxæ and most of fore femora black; tips of coxæ, base and broad tips of fore femora, middle and hind femora, trochanters and tibiæ yellow, upper edge of posterior femora sometimes brown; tarsi blackened from tip of first joint; fore tibiæ without bristles, those of middle and hind tibiæ moderately strong; fore and middle tarsi plain, with tips of second, third and fourth joints a very little thickened; hind tarsi (Fig. 24) with third and fourth joints a little thickened, third with a stout, curved spur at tip, which is a little shorter than the joint; joints of fore tarsi as 23-10-6-5-6; of middle ones as 37-15-11-8-7; those of hind ones as 25-18-8-11-8. Calypters mostly brownish with yellow cilia; halteres yellow.

Wings grayish; third vein bent backward a little toward tip; last section of fourth vein bent near basal third, nearly parallel with third beyond this bend, its tip distinctly before apex of wing; last section of fifth vein as 50, cross vein as 15; anal angle prominent but broadly rounded; sixth vein distinct, not reaching wing margin.

Female. Face wide, silvery white, its sides nearly parallel; palpi yellow, white-pollinose; third antennal joint as long as wide; color of front, thorax, abdomen, legs and feet about as in the male; all tarsi slender, plain; joints of fore tarsi as 29-12-9-6-6; of middle ones as 40-17-13-8-6; those of posterior pair as 33-23-15-11-8; venation as in the male.

Described from seven males and two females; holotype, allotype and two paratypes were taken by the author June 9, 1915, at Colorado Springs, Colorado; four male paratypes were taken at Cloudcroft, New Mexico, June 18 and 19, 1902; the female paratype at the same place on June 21. Type in author's collection.

Sympycnus canadensis Van Duzee

Canadian Entomologist, Vol. xlix, 339, 1917. Ontario; New York.

Male. Length, 2 mm. Face rather wide, silvery white; antennæ black, third joint triangular, as long as wide; dorsum of thorax with a broad, median, violet stripe, more coppery on the sides and with large, velvety black spots above root of wings; second and third abdominal segments mostly yellow; hypopygium (Fig. 76) mostly concealed and with black lamellæ; coxæ and legs yellow; upper edge of hind femora on apical half, whole of hind tibiæ and tarsi and last two joints of fore and middle tarsi black; joints of fore tarsi as 16-7-6-4-5; of middle ones as 28-12-8-7-5; joints of posterior pair as 16-13-9-6-7; calypters, their cilia and the halteres yellow; last section of fifth vein as 27, cross vein as 9.

Sympycnus caudatus Van Duzee

Canadian Entomologist, Vol. xlix, 338, 1917. California.

Male. Length, 2-3 mm. First two antennal joints yellow, third black (Fig. 13) scarcely as long as wide; eyes contiguous; front and thorax bronze brown; abdomen a little yellow at base; hypopygium brown with very long, yellow outer appendages, which are fringed with long hairs; fore coxæ, all femora, tibiæ and tarsi yellow, sometimes the tarsi are slightly infuscated from tip of first joint, but usually almost wholly pale yellow; fore tarsi as in Figure 14; joints of fore tarsi as 20-7-6-6-6; of middle ones as 29-17-9-7-5; joints of posterior pair as 15-21-12-9-7; fore pulvilli enlarged; last section of fifth vein as 35, cross vein as 11; calypters, their cilia and the halteres yellow.

Sympycnus clavatus Van Duzee

Entomological News, Vol. xxiv, 271, 1913. New Mexico; Arizona; Colorado.

Male. Length, 2.5-3 mm. Eyes contiguous; first two antennal joints yellow (Fig. 7), third small, brown; thorax dark green, humeri yellowish; abdomen largely yellow, hairs and bristles on first segment yellow; hypopygium blackish; all coxæ, femora, tibiæ and fore (Fig. 8) and middle tarsi yellow, last two or three joints of these tarsi black; hind tibiæ enlarged toward tip with a sharply defined, wide, black tip; hind tarsi scarcely half as long as tibia with basal half of first joint white; joints of fore tarsi as 22-6-5-5-7; of middle ones as 35-16-11-7-7; of posterior pair as 26-16-14-10-8; last section of fifth vein as 20, cross vein as 15.

Sympycnus cuprinus Wheeler

Proc. Calif. Acad. Sci., Ser. 3, Zoöl., Vol. ii, 50, 1899. Western States; Alaska.

Male. Length, 2.5-3 mm. Antennæ (Fig. 1) black; face and palpi covered with silvery white pollen; front dull black; thorax dark green with brown pollen; abdomen green, without yellow on sides; coxæ black with yellow tips, anterior pair with several silvery white hairs; basal half or more of fore femora and upper edge of hind femora blackish, remainder of femora yellow; tibiæ yellow, tips of hind ones black; fore and middle tarsi from tip of first joint and hind ones wholly black; all tarsi plain; fore pulvilli enlarged; joints of fore tarsi as 19-8-8-7-7; of middle ones as 31-14-8-8-5; of posterior pair as 23-20-12-7-7; calypters, their cilia and the halteres yellow, the cilia appearing dark in certain lights; last section of fifth vein as 32, cross vein as 12.

Sympycnus fasciventris Van Duzee

Canadian Entomologist, Vol. xlix, 337, 1917. California; Oregon; Colorado.

Male. Length, 3 mm. Eyes contiguous; lower orbital cilia black, short; antennæ (Fig. 31) black; thorax brown, nearly opaque, with gray pollen, bristles inserted in brown dots; abdomen green or coppery with apical margins of segments broadly covered with gray pollen; sometimes this portion of the segments is more green when anterior part is coppery; fore coxæ yellow with white hair; femora and tibiæ yellow; fore and middle tarsi almost wholly yellow; hind tarsi (Fig. 32) black from tip of first joint; fore pulvilli enlarged; joints of fore tarsi as 19-8-5-4-7; of middle ones as 40-15-10-7-6; joints of posterior tarsi as 25-18-8-10-6; last section of fifth vein as 41, cross vein as 12; fourth vein ending in apex of wing.

Sympycnus globulicauda Van Duzee, new species

Male. Length, 2.7 mm. Eyes touching below, leaving a small grayish white triangle above; palpi yellowish brown with white pollen; front dark green, dulled with gray pollen; antennæ (Fig. 28) black, third joint fully twice as long as wide.

Thorax green; dorsum with brownish pollen and three, broken, shining brownish stripes along the rows of bristles; acrostichal bristles few and very small; pleuræ more black, white-pollinose; abdomen green with bronze reflections, its hair black; hypopygium (Fig. 30) large and globular, its outer lamellæ brownish black, fringed with small hairs.

Coxæ black, anterior ones with a few black hairs, which are longer and more bristle-like at tip; fore femora blackened on basal

half, yellow at extreme base and on apical portion; trochanters, middle and hind femora, all tibiæ and base of all tarsi yellow, all tarsi more or less blackened from tip of first joint; fore tibiæ without bristles; middle tibiæ with three rather large ones; hind tibiæ with several smaller bristles; hind tarsi (Fig. 29) with three bristles on side of first joint, second with two bristles, third joint with several larger ones on the side and a strong one at tip, fourth joint thickened when seen from the side; fore and middle tarsi plain; pulvilli of all tarsi a little enlarged; joints of fore tarsi as 18-9-6-5-5; of middle ones as 25-11-14-11-10; joints of hind tarsi as 22-17-8-11-6. Calypters with black cilia; halteres yellow.

Wings grayish; last section of fourth vein bent near basal third, nearly parallel with third at tip, reaching the wing margin before the apex of wing; last section of fifth vein as 42, cross vein as 12; anal angle of wing rather prominent.

Described from one male, taken by the author June 9, 1915, at Colorado Springs, Colorado. Type in author's collection.

Sympycnus inæqualis Van Duzee, new species

Male. Length, 2 mm. Head in the type shrunken so the eyes touch; palpi yellowish, almost yellowish brown; antennæ (Fig. 11) with first two joints yellowish, third black, triangular, considerably longer than wide.

Thorax blue-green, dorsum with brown pollen; acrostichal bristles few but long; abdomen blackish green, base yellowish, especially first segment, its hairs mostly yellowish, first segment with long yellow bristles on sides; hypopygium (Fig. 12) shining black with moderately long, pointed lamellæ, which are yellow at base and have long hairs on sides and a hair at tip as long as the lemallæ.

Coxæ, femora and tibiæ yellow, middle, hind and upper surfaces of hind femora brownish, hind tibiæ more brown and slightly enlarged on apical half, but all these appear more yellow in certain lights; tarsi brown, fore and middle pairs appear yellow when seen in the right light; anterior and posterior tarsi plain, first three joints of middle tarsi plain (last two joints missing in type); joints of fore tarsi as 36-17-19-8-7; first three joints of middle tarsi as 42-19-13; of posterior ones as 19-32-13-11-7; pulvilli of fore tarsi not or scarcely enlarged. Calypters, their cilia and the halteres yellow.

Wings grayish; fourth vein ending in apex of wing; last section of fifth vein nearly straight, twice as long as cross vein; anal angle of wing quite prominent.

Female. Five females that probably are of this species were taken with the male but differ considerably from it: Face wide, gray-pollinose; antennæ wholly black, third joint as long as wide; hind tibiæ yellow, scarcely darker at tip; hind femora black on apical fourth; first joint of hind tarsi nearly as long as second. They agree

with the male in having the last section of fifth vein straight and twice as long as cross vein; third and fourth veins straight and parallel, fourth ending in apex of wing; all coxæ yellow, and posterior margin of pleuræ a little yellowish below. Dorsum of thorax in females shining brownish with quite distinct lines, in male bluish without lines.

Described from one male and five females, taken by the author at Konocti Bay, Clear Lake, Lake County, California, May 10, 1926. Type in the author's collection.

Sympycnus lævigatus Van Duzee, new species

Male. Length, 3 mm. Face very narrow, eyes touching in middle of face (head shrunken) leaving a long, white triangle above and below; palpi rather large, yellow; front and occiput blackish green, white-pollinose; antennæ (Fig. 9) with first two joints yellow, third joint blackish, a little yellowish at base, very small, rounded; lower orbital cilia white.

Thorax green, dulled with white pollen, viewed obliquely the pollen on the middle of the dorsum is more brownish, forming three distinct brown lines, the middle one reaching the scutellum; humeri below and the posterior edge of pleuræ yellow; acrostichal bristles not distinguishable in type; dorsum of abdomen shining black, second and third segments yellowish brown, lighter in color at base of second, becoming more black on hind margin of third; hairs of abdomen black, the long ones on lower edge of first and second segments yellow; venter yellow; hypopygium shining black, its outer lamellæ short, narrow, yellow, inner appendages black.

Coxæ, femora and tibiæ yellow; hind femora slightly brown above on apical half; fore coxæ with small white hairs on anterior surface and yellow bristles at tip; fore and middle tarsi yellow with last joint black, seen in certain lights some of the other joints appear infuscated; hind tarsi black from tip of first joint; fore tarsi (Fig. 10) with long hair and with the joints a little thickened, their pulvilli enlarged; fore tarsi with the joints as 22-9-7-5-7, pulvilli as 4; joints of middle tarsi as 36-17-14-8-6; of hind ones as 23-25-16-11-10. Calypters yellow with black tip and yellow cilia; halteres yellow.

Wings grayish, darker in front; third vein a little bent backward at tip; last section of fourth vein without a bend, nearly parallel with third, ending in apex of wing; last section of fifth vein as 24, cross vein as 15; wings narrowed at base.

Female. Face wide, black with gray pollen; palpi brownish; antennæ as in male; no acrostichal bristles; abdomen metallic coppery black with large yellow spots on sides of second and third segments and small ones on sides of first; legs and feet colored as in the male; joints of posterior tarsi as 28-30-20-11-10; wings more

tinged with brown; venation as in the male; last section of fifth vein as 22, cross vein as 25; wings less narrowed at base.

Described from one pair, taken by the author, May 7 and 8, 1915, at Berkeley, California. Types in the author's collection.

Sympycnus latitarsis Van Duzee, new species

Male. Length, 2 mm. Face, front, occiput and palpi black; face very narrow with sides parallel below the middle and a little grayish brown pollen; antennæ (Fig. 15) black, first joint rather long, third small, somewhat triangular, as long as wide; lower posterior orbits with a few small, white cilia.

Thorax green; dorsum with a little brown pollen and indistinct, broken, brown lines along the rows of bristles; acrostichal bristles few and small; abdomen greenish black, second and third segments largely yellow on the sides and venter; hairs of abdomen black; hypopygium large, shining black with short pale hairs. (It is broken off, but still adheres to the abdomen in the only specimen I have.)

Fore coxæ yellowish, almost brown; middle and hind ones black; femora and tibiæ dark yellow, fore femora somewhat blackened at base; all tarsi yellow at base, blackened from the tip of first joint; fore tarsi (Figs. 16 and 17) flattened, gradually widened from base to near the tip of second joint, then becoming smaller, last joint nearly normal; first joint with a long bristle at tip that is a little shorter than second joint; second joint with three large bristles that do not show when viewed from above the broad upper surface; joints of fore tarsi as 20-11-7-5-6; of middle ones as 27-14-10-6-6; joints of posterior pair as 18-20-13-9-7. Halteres yellow.

Wings grayish, slightly darker in front; third and last section of fourth vein nearly straight and parallel, fourth ending in the apex of the wing; last section of fifth vein as 35, cross vein as 12.

Described from one male, taken by the author June 7, 1915, at Wendover, Utah. Type in the author's collection.

Sympycnus lineatus Loew

Neue Beitr., Vol. viii, 67, 1861; Mon. N. Am. Diptera, Vol. ii, 189, 1864. Eastern States to Kansas.

Length, 2-3 mm. Antennæ (Fig. 2) more or less yellow or yellowish; dorsum of thorax grayish brown with darker lines; abdomen brownish gray to yellowish brown; hypopygium black with narrow, straight, rather long, brown appendages projecting downward; coxæ, legs and feet yellowish; joints of fore tarsi as 22-9-6-5-5; of middle ones as 33-14-11-6-5; of posterior pair as 17-22-15-14-7; third and fourth veins nearly straight and parallel, fourth ending in apex of wing; last section of fifth vein as 22, cross vein as 10.

SYMPYCNUS MARCIDUS Wheeler

Proc. Calif. Acad. Sci., Ser. 3, Zoöl., Vol. ii, 48, 1899. Wyoming; Alberta.

Male. Length, 2.5-3 mm. Antennæ (Fig. 33) small, black, third joint as long as wide; face very narrow, white; palpi minute, yellow; thorax dull green; abdomen green with coppery reflections; venter yellow; hypopygium shining black with a rather long, straight, yellowish appendage extending downward; coxæ yellow, middle and hind ones infuscated on outer surface, fore coxæ with white hairs; femora and tibiæ yellow; fore tarsi (Fig. 34) shorter than their tibiæ; fore pulvilli white, enlarged; hind tarsi (Figs. 35, 36) blackened from tip of first joint; joints of fore tarsi as 13-6-5-4-6; of middle ones as 38-17-13-8-7; of posterior pair as 27-20-14-8-7; fourth vein ending in apex of wing; last section of fifth vein as 43, cross vein as 10; calypters and halteres yellow, cilia of former white; hind tibiæ and tips of hind femora sometimes brown.

Sympycnus montanus Van Duzee, new species

Male. Length, 2.2 mm. Eyes contiguous below (perhaps from the head being shrunken), leaving a gray triangle above; front and occiput dull blackish; palpi yellow; antennæ black, third joint small, triangular, arista dorsal.

Dorsum of thorax green with brown pollen; pleuræ white-pollinose, posterior edge of pleuræ and spot at root of wing yellowish; a scarcely visible depressed area before the scutellum; abdomen shining black with a reddish yellow tinge on basal half; venter yellow at base; hairs on dorsum of abdomen black, on sides at base yellowish; hypopygium black, its small outer lamellæ black with several long hairs at tip; inner appendages more testaceous.

Coxæ, femora and tibiæ yellow; fore coxæ with a few yellow hairs; fore tarsi yellow at base, blackened from second joint; middle tarsi (Fig. 42) yellow with last two joints black and widened; hind tarsi black from tip of first joint; joints of fore tarsi as 17-7-5-4-6; their pulvilli enlarged; joints of middle tarsi as 28-13-11-5-6; of posterior pair as 17-17-12-8-7. Calypters, their cilia and the halteres yellow.

Wings grayish, narrowed a little at base; last section of fourth vein straight, nearly parallel with third, ending in the apex of the wing; last section of fifth vein as 23, cross vein as 15.

Described from one male taken by J. M. Aldrich, June 4, 1910, on Mount Moscow, Idaho. Type in the United States National Museum.

THE PAN-PACIFIC ENTOMOLOGIST
Published quarterly by the Pacific Coast Entomological Society in coöperation with the California Academy of Sciences
E. P. Van Duzee, Editor S. B. Freeborn, Treasurer

EDITORIAL COMMENT

Several members of the Pacific Coast Entomological Society have been in the field again during the past season. Mr. J. O. Martin and Mr. Gorton Linsley went by auto to Brownsville, Texas, stopping for a little work in Arizona and New Mexico. Their work will add several thousand insects of the southern Texas fauna, which has not been as well represented as it should be in the collection of the Academy. Dr. E. C. Van Dyke covered some interesting localities in a circuit including Salt Lake City, the Grand Teton, Yellowstone and Glacier National Parks and Steven's Pass in the Cascade Mountains in Oregon, altogether adding about three thousand insects to the Academy collections. Mr. J. E. Cottle made two or three short trips for Lepidoptera, the most important of which was to Modoc County, California, and a number of similar collecting trips within California were made by Mr. Sternitzky. Mr. Robert Usinger and Robert Wind were members of a Boy Scout party under the direction of Dr. Ansel Hall, that visited the Grand Canyon of the Colorado and several interesting localities in the Rocky Mountains. Both were able to make some valuable additions to their collections. Your editor did some work in the "Mother Lode Country" in the Sierra foothills, adding about 1800 insects to the Academy collection, and Dr. F. E. Blaisdell took some interesting material during a short stay in the Yosemite Valley. During last winter Mr. Theo O. Zschokke and Mr. Richard Blackwelder collected for a time about Gatun Lake, Panama, Canal Zone. The Hemiptera came to the Academy collection and made a most welcome addition, as the representation of the Biologia fauna already there was comparatively meagre.

Among the welcome visitors at the Entomology Department of the California Academy of Sciences during the summer holidays may be mentioned: S. A. Rohwer, of the Department of Agriculture, Washington; R. H. Painter, Agricultural College, Manhattan, Kansas; Dwight M. De Long, Ohio State University, Columbus, Ohio, and B. Prashad, director, Zoölogical Survey of India, Calcutta, India.